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Attorneys for Plaintiffs
LG ELECTRONICS U.S.A., INC.,
LG ELECTRONICS, INC., &
LG ELECTRONICS MONTERREY
MEXICO, S.A., DE, CV

**UNITED STATES DISTRICT COURT
DISTRICT OF NEW JERSEY**

LG ELECTRONICS U.S.A., INC.,
LG ELECTRONICS, INC., &
LG ELECTRONICS MONTERREY
MEXICO, S.A., DE, CV,

Plaintiffs,

v.

WHIRLPOOL CORPORATION,
WHIRLPOOL PATENTS COMPANY,
WHIRLPOOL MANUFACTURING
CORPORATION, &
MAYTAG CORPORATION,

Defendants.

Civil Action No. _____

**COMPLAINT FOR
DECLARATORY JUDGMENT**

Plaintiffs LG Electronics U.S.A., Inc., LG Electronics, Inc., and LG Electronics

Monterrey Mexico, S.A., DE, CV (collectively, "LG") allege as follows for their Complaint for

Declaratory Judgment against Defendants Whirlpool Corporation, Whirlpool Patents Company, Whirlpool Manufacturing Corporation, and Maytag Corporation (collectively, “Whirlpool”):

Parties

1A. Plaintiff LG Electronics U.S.A., Inc. is a Delaware corporation having a principal place of business at 1000 Sylvan Avenue, Englewood Cliffs, New Jersey 07632.

1B. Plaintiff LG Electronics, Inc. is a Korean corporation having a principal place of business at LG Twin Towers, 20 Yoido-dong, Yeongdeungpo-gu, Seoul, Korea 150-721.

1C. Plaintiff LG Electronics Monterrey Mexico, S.A., DE, CV is a Mexican corporation having a principal place of business at Av. Industrias 180, Fracc Industrial Pimsa Ote., 66603 Apodaca, Nuevo Leon, Mexico.

1D. On information and belief, Defendant Whirlpool Corporation is a Delaware corporation having a principal place of business at 2000 North M-63, Benton Harbor, Michigan 49022.

1E. On information and belief, Defendant Whirlpool Patents Company is a Michigan corporation having a principal place of business at 500 Renaissance Drive, Suite 102, St. Joseph, Michigan 49085 and is a wholly owned subsidiary of Whirlpool Corporation.

1F. On information and belief, Defendant Whirlpool Manufacturing Corporation is a Michigan corporation having a principal place of business at 500 Renaissance Drive, Suite 102, St. Joseph, Michigan 49085 and is a wholly owned subsidiary of Whirlpool Corporation.

1G. On information and belief, Defendant Maytag Corporation is a Delaware corporation having a principal place of business at 2000 North M-63, Benton Harbor, Michigan 49022 and is a wholly owned subsidiary of Whirlpool Corporation.

Jurisdiction and Venue

2. LG brings this civil action under the Patent Laws, Title 35 of the United States Code, and under 28 U.S.C. § 2201 to obtain a declaration of noninfringement and/or invalidity and/or unenforceability with respect to U.S. Patent Nos. 6,082,130, 6,810,680, 6,915,644, 6,971,730, and 7,240,980 (collectively, “the patents-in-suit” or “the asserted patents”). Since this action arises under the Patent Laws of the United States, this Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a).

3. Venue in this judicial district is proper under 28 U.S.C. §§ 1391(b), 1391(c) and 1400(b).

Background

4. LG hereby restates and realleges the allegations set forth in paragraphs 1 through 3 and incorporates them by reference.

5. On information and belief, Whirlpool Patents Company is the owner by assignment of U.S. Patent No. 6,082,130 and Maytag Corporation is the owner by assignment of U.S. Patent Nos. 6,810,680, 6,915,644, 6,971,730, and 7,240,980.

6. On January 23, 2008, Whirlpool filed a Complaint with the U.S. International Trade Commission (ITC) alleging that LG was engaging in unfair acts in violation of Section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, through the alleged importation into the United States, the sale for importation into the United States, and/or the sale or offer for sale within the United States after importation, of refrigerators and components that were alleged to infringe the patents-in-suit. The ITC instituted the investigation on February 21, 2008, and the investigation has been captioned *In re CERTAIN REFRIGERATORS AND COMPONENTS THEREOF*, Inv. No. 337-TA-632 (ITC).

7. Whirlpool, based on its alleged assertion of infringement of the asserted patents before the ITC, is seeking a permanent exclusion order under Section 337(d) and a cease and desist order under Section 337(f)(1). LG denies that it infringes any valid and enforceable claims of the asserted patents, or that Whirlpool is entitled to any relief for the alleged infringement of the asserted patents.

8. In view of Whirlpool's Complaint against LG with the ITC and the pending ITC investigation, and in view of Whirlpool's assertions of patent infringement and requests for relief and LG's denials, an actual and justiciable controversy exists between LG and Whirlpool regarding the infringement, validity, and/or enforceability of the patents asserted in the ITC investigation, the rights of the respective parties regarding Whirlpool's allegations of infringement, and the remedies available to the respective parties regarding Whirlpool's assertion of infringement.

**First Count: Declaratory Judgment of
Noninfringement and Invalidity of U.S. Patent No. 6,082,130**

9. Plaintiffs hereby restate and reallege the allegations set forth in paragraphs 1 through 8 and incorporate them by reference.

10. On information and belief, Defendant Whirlpool Patents Company is the owner by assignment of U.S. Patent No. 6,082,130, entitled "Ice Delivery System for a Refrigerator." A copy of U.S. Patent No. 6,082,130 is attached as Exhibit A.

11. Plaintiffs have not infringed and are not infringing, either directly or indirectly, contributorily or otherwise any of the claims of U.S. Patent No. 6,082,130.

12. Plaintiffs cannot be liable for infringement of U.S. Patent No. 6,082,130 because the claims are invalid under one or more provisions of 35 U.S.C. §§ 102, 103, and/or 112, and/or the patent is unenforceable.

13. On information and belief, Whirlpool, either in initiating the ITC investigation or in pursuing the ITC investigation and its claims of patent infringement against LG regarding the above patent, has presented and pursued allegations of patent infringement against LG in bad faith and for ulterior purposes not proper under the law.

**Second Count: Declaratory Judgment of
Noninfringement and Invalidity of U.S. Patent No. 6,810,680**

14. Plaintiffs hereby restate and reallege the allegations set forth in paragraphs 1 through 13 and incorporate them by reference.

15. On information and belief, Defendant Maytag Corporation is the owner by assignment of U.S. Patent No. 6,810,680, entitled "Ice Maker Fill Tube Assembly." A copy of U.S. Patent No. 6,810,680 is attached as Exhibit B.

16. Plaintiffs have not infringed and are not infringing, either directly or indirectly, contributorily or otherwise any of the claims of U.S. Patent No. 6,810,680.

17. Plaintiffs cannot be liable for infringement of U.S. Patent No. 6,810,680 because the claims are invalid under one or more provisions of 35 U.S.C. §§ 102, 103, and/or 112, and/or the patent is unenforceable.

18. On information and belief, one or more numbered claims of the above patent asserted by Whirlpool against LG in the ITC investigation are invalid over prior art that Whirlpool, or its predecessors, placed into the public domain.

19. On information and belief, one or more numbered claims of the above patent asserted by Whirlpool against LG in the ITC investigation are invalid over prior art that Whirlpool, or its predecessors, placed into the public domain and that Whirlpool, in a reasonable investigation, would have found or should have found, before it filed its Complaint in the ITC.

20. On information and belief, when prosecuting and obtaining the above patent asserted by Whirlpool against LG in the ITC investigation, Whirlpool did not comply with the duty of disclosure owed to the U.S. Patent and Trademark Office and the public.

21. On information and belief, Whirlpool, either in initiating the ITC investigation or in pursuing the ITC investigation and its claims of patent infringement against LG regarding the above patent, has presented and pursued allegations of patent infringement against LG in bad faith and for ulterior purposes not proper under the law.

**Third Count: Declaratory Judgment of
Noninfringement and Invalidity of U.S. Patent No. 6,915,644**

22. Plaintiffs hereby restate and reallege the allegations set forth in paragraphs 1 through 21 and incorporate them by reference.

23. On information and belief, Defendant Maytag Corporation is the owner by assignment of U.S. Patent No. 6,915,644, entitled “Ice Maker Fill Tube Assembly.” A copy of U.S. Patent No. 6,915,644 is attached as Exhibit C.

24. Plaintiffs have not infringed and are not infringing, either directly or indirectly, contributorily or otherwise any of the claims of U.S. Patent No. 6,915,644.

25. Plaintiffs cannot be liable for infringement of U.S. Patent No. 6,915,644 because the claims are invalid under one or more provisions of 35 U.S.C. §§ 102, 103, and/or 112, and/or the patent is unenforceable.

26. On information and belief, one or more numbered claims of the above patent asserted by Whirlpool against LG in the ITC investigation are invalid over prior art that Whirlpool, or its predecessors, placed into the public domain.

27. On information and belief, one or more numbered claims of the above patent asserted by Whirlpool against LG in the ITC investigation are invalid over prior art that

Whirlpool, or its predecessors, placed into the public domain and that Whirlpool, in a reasonable investigation, would have found or should have found, before it filed its Complaint in the ITC.

28. On information and belief, when prosecuting and obtaining the above patent asserted by Whirlpool against LG in the ITC investigation, Whirlpool did not comply with the duty of disclosure owed to the U.S. Patent and Trademark Office and the public.

29. On information and belief, Whirlpool, either in initiating the ITC investigation or in pursuing the ITC investigation and its claims of patent infringement against LG regarding the above patent, has presented and pursued allegations of patent infringement against LG in bad faith and for ulterior purposes not proper under the law.

**Fourth Count: Declaratory Judgment of
Noninfringement and Invalidity of U.S. Patent No. 6,971,730**

30. Plaintiffs hereby restate and reallege the allegations set forth in paragraphs 1 through 29 and incorporate them by reference.

31. On information and belief, Defendant Maytag Corporation is the owner by assignment of U.S. Patent No. 6,971,730, entitled "Freezer Drawer Support Assembly." A copy of U.S. Patent No. 6,971,730 is attached as Exhibit D.

32. Plaintiffs have not infringed and are not infringing, either directly or indirectly, contributorily or otherwise any of the claims of U.S. Patent No. 6,971,730.

33. Plaintiffs cannot be liable for infringement of U.S. Patent No. 6,971,730 because the claims are invalid under one or more provisions of 35 U.S.C. §§ 102, 103, and/or 112, and/or the patent is unenforceable.

34. On information and belief, one or more numbered claims of the above patent asserted by Whirlpool against LG in the ITC investigation are invalid over prior art that Whirlpool, or its predecessors, placed into the public domain.

35. On information and belief, one or more numbered claims of the above patent asserted by Whirlpool against LG in the ITC investigation are invalid over prior art that Whirlpool, or its predecessors, placed into the public domain and that Whirlpool, in a reasonable investigation, would have found or should have found, before it filed its Complaint in the ITC.

36. On information and belief, when prosecuting and obtaining the above patent asserted by Whirlpool against LG in the ITC investigation, Whirlpool did not comply with the duty of disclosure owed to the U.S. Patent and Trademark Office and the public.

37. On information and belief, Whirlpool, either in initiating the ITC investigation or in pursuing the ITC investigation and its claims of patent infringement against LG regarding the above patent, has presented and pursued allegations of patent infringement against LG in bad faith and for ulterior purposes not proper under the law.

**Fifth Count: Declaratory Judgment of
Noninfringement and Invalidity of U.S. Patent No. 7,240,980**

38. Plaintiffs hereby restate and reallege the allegations set forth in paragraphs 1 through 37 and incorporate them by reference.

39. On information and belief, Defendant Maytag Corporation is the owner by assignment of U.S. Patent No. 7,240,980, entitled "Freezer Drawer Support Assembly." A copy of U.S. Patent No. 7,240,980 is attached as Exhibit E.

40. Plaintiffs have not infringed and are not infringing, either directly or indirectly, contributorily or otherwise any of the claims of U.S. Patent No. 7,240,980.

41. Plaintiffs cannot be liable for infringement of U.S. Patent No. 7,240,980 because the claims are invalid under one or more provisions of 35 U.S.C. §§ 102, 103, and/or 112, and/or the patent is unenforceable.

42. On information and belief, one or more numbered claims of the above patent asserted by Whirlpool against LG in the ITC investigation are invalid over prior art that Whirlpool, or its predecessors, placed into the public domain.

43. On information and belief, one or more numbered claims of the above patent asserted by Whirlpool against LG in the ITC investigation are invalid over prior art that Whirlpool, or its predecessors, placed into the public domain and that Whirlpool, in a reasonable investigation, would have found or should have found, before it filed its Complaint in the ITC.

44. On information and belief, when prosecuting and obtaining the above patent asserted by Whirlpool against LG in the ITC investigation, Whirlpool did not comply with the duty of disclosure owed to the U.S. Patent and Trademark Office and the public.

45. On information and belief, Whirlpool, either in initiating the ITC investigation or in pursuing the ITC investigation and its claims of patent infringement against LG regarding the above patent, has presented and pursued allegations of patent infringement against LG in bad faith and for ulterior purposes not proper under the law.

Prayers for Relief

WHEREFORE, Plaintiffs pray that this Court:

A. Declare that Plaintiffs have not infringed and are not infringing any of the claims of U.S. Patent Nos. 6,082,130, 6,810,680, 6,915,644, 6,971,730, and 7,240,980;

B. Declare that the claims of U.S. Patent Nos. 6,082,130, 6,810,680, 6,915,644, 6,971,730, and 7,240,980 are invalid and/or unenforceable;

C. Declare this case exceptional under 35 U.S.C. § 285 and award Plaintiffs their costs, disbursements, and attorney fees in connection with this action;

D. Enjoin Whirlpool from making any further allegations of infringement of the above patents against LG;

E. Order Whirlpool to take corrective measures to offset and avoid any further injury to LG; and

F. Award Plaintiffs such other and further relief, including an award of its attorney fees incurred and its damages caused by Whirlpool's allegations of patent infringement of the above patents and Whirlpool's actions and claims for relief based on that allegation, as this Court may deem just and proper.

Certification Pursuant To L.Civ.R. 11.2

Plaintiffs, by their undersigned counsel, hereby certify pursuant to L.Civ.R. 11.2 that the matters in controversy are not the subject of any other action pending in any other court or of any pending arbitration or administrative proceeding, with the exception of the pending ITC proceeding referenced above.

Dated: April 16, 2008

/s/ Thomas R. Curtin

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LG ELECTRONICS MONTERREY

MEXICO, S.A., DE, CV

EXHIBIT A



US006082130A

United States Patent [19][11] **Patent Number:** **6,082,130****Pastryk et al.**[45] **Date of Patent:** **Jul. 4, 2000**[54] **ICE DELIVERY SYSTEM FOR A REFRIGERATOR**

[75] Inventors: **Jim J. Pastryk**, New Troy; **Mark H. Nelson**, Berrien Springs; **Verne H. Myers**, St. Joseph, all of Mich.; **Daryl L. Harmon**, Newburgh, Ind.; **Andrew M. Oltman**; **Gregory G. Hortin**, both of Evansville, Ind.; **Devinder Singh**, St. Joseph, Mich.

4,100,761 7/1978 Linstromberg et al. 62/137
 4,176,527 12/1979 Linstromberg et al. 62/320
 4,227,383 10/1980 Horvay 62/344
 4,649,717 3/1987 Tate, Jr. et al. 62/240
 4,756,165 7/1988 Chestnut et al. 62/135
 4,942,979 7/1990 Linstromberg et al. 221/75
 4,970,871 11/1990 Rudick 62/187
 5,033,273 7/1991 Buchser et al. 62/344
 5,050,777 9/1991 Buchser 222/146
 5,160,094 11/1992 Willis et al. 62/137
 5,187,950 2/1993 Weldon 62/449

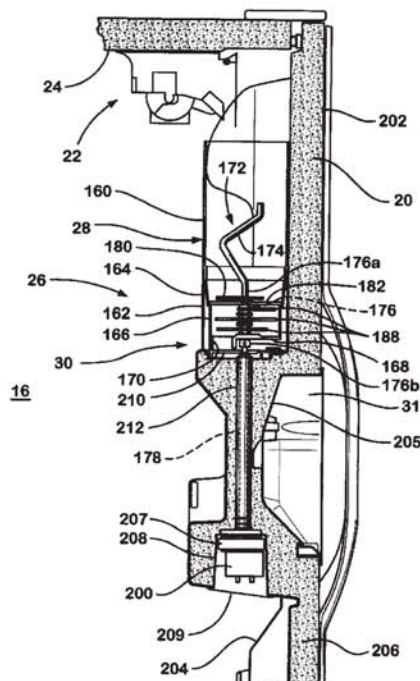
[73] Assignee: **Whirlpool Corporation**, Benton Harbor, Minn.

Primary Examiner—William E. Tapolcai
Attorney, Agent, or Firm—Stephen D. Krefman; Joel M. Van Winkle; Robert O. Rice

[21] Appl. No.: **09/221,534**[57] **ABSTRACT**[22] Filed: **Dec. 28, 1998**[51] **Int. Cl.**⁷ **F25C 5/18**[52] **U.S. Cl.** **62/344; 222/146.6**[58] **Field of Search** 62/344; 222/146.6[56] **References Cited****U.S. PATENT DOCUMENTS**

2,785,539 3/1957 Simmons et al. 62/108.5
 3,025,683 3/1962 Baker et al. 62/419
 3,146,601 9/1964 Gould 62/344
 3,226,939 1/1966 Harbison et al. 62/344
 3,545,217 12/1970 Linstromberg 62/137
 3,602,007 8/1971 Drieci 62/344
 3,621,668 11/1971 Swerbinsky 62/137
 3,635,043 1/1972 Sterling 62/137
 3,747,363 7/1973 Grimm 62/377
 3,798,923 3/1974 Pink et al. 62/344
 4,084,725 4/1978 Buchser 221/75

A refrigerator having a cabinet defining a freezer compartment having an access opening and a closure member for closing the access opening. An ice maker is disposed within the freezer compartment for forming ice pieces and an ice storage bin is removably mounted to the closure member below the ice maker for receiving ice from the ice maker. The ice storage bin has an upper portion which is transparent and has a bottom opening. An ice discharge chute extends through the closure member below the bottom opening of the ice storage bin. A motor is mounted on the closure member. An auger is vertically disposed within the ice storage bin and is drivingly connected to the motor. Upon energization of the motor, the auger moves ice pieces from the ice storage bin through the bottom opening to the ice discharge chute for dispensing ice pieces from the ice storage bin.

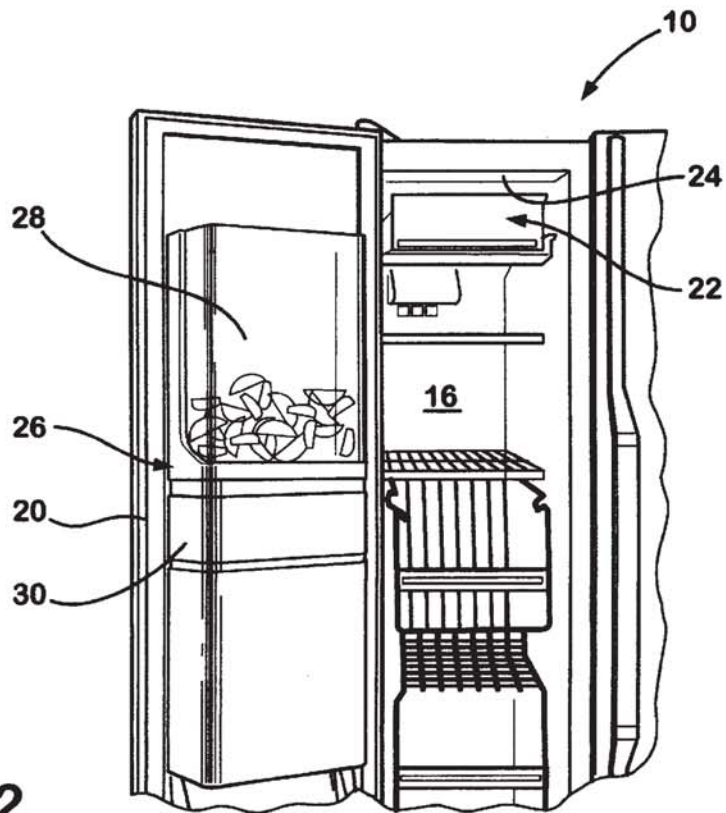
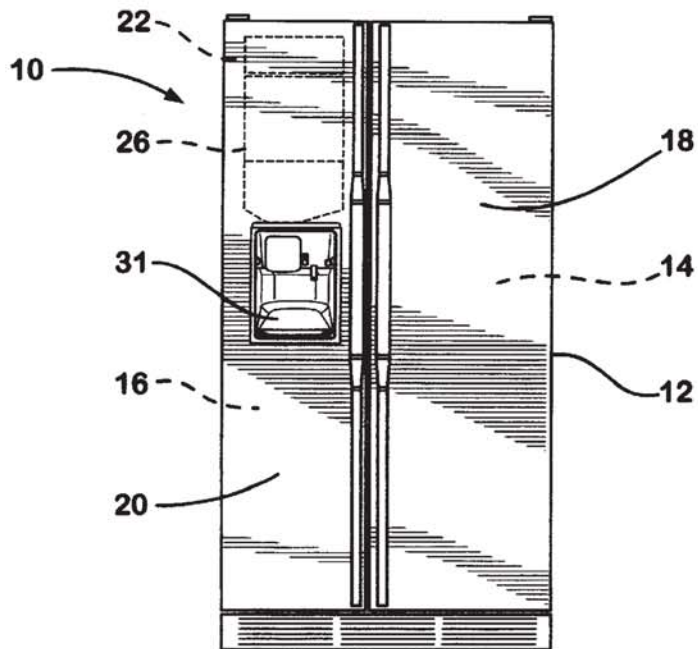
25 Claims, 7 Drawing Sheets

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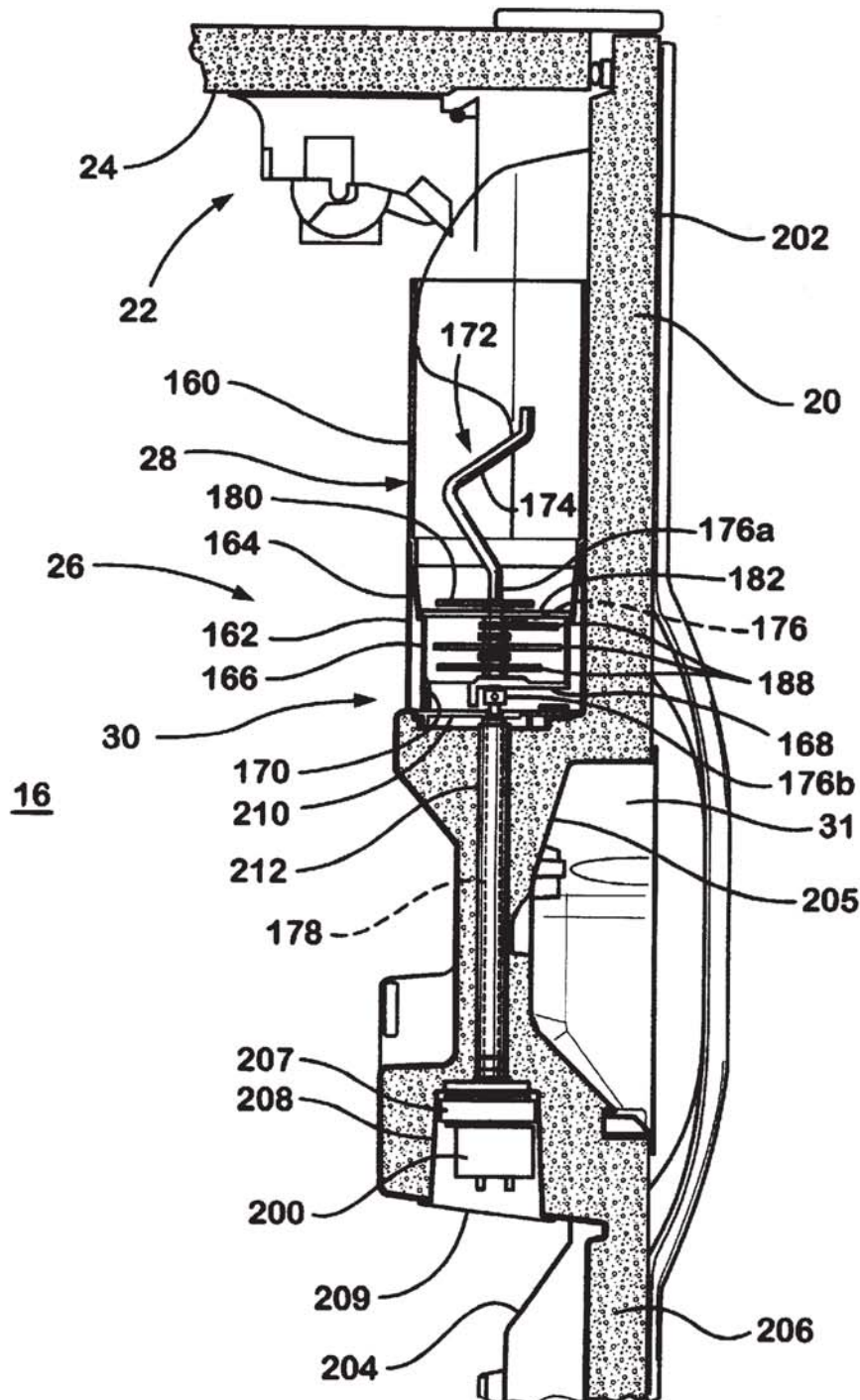


Fig. 3

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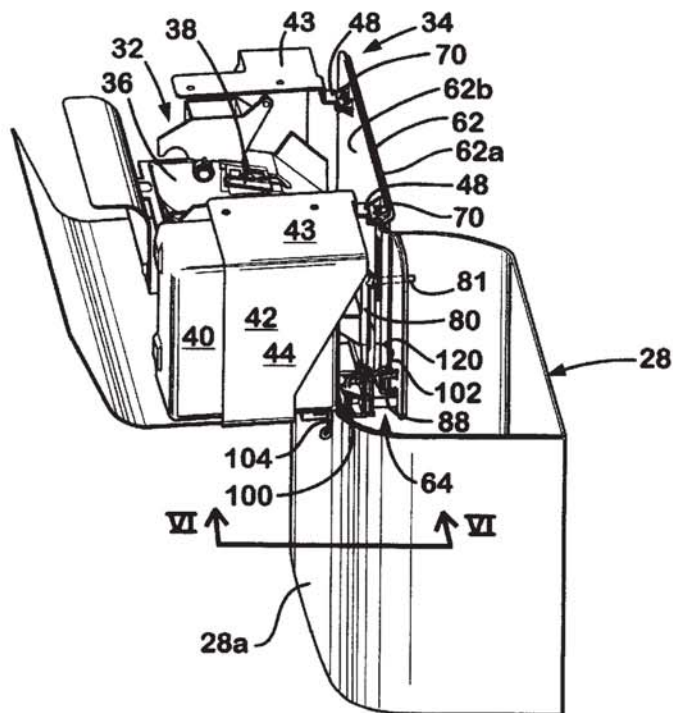


Fig. 4

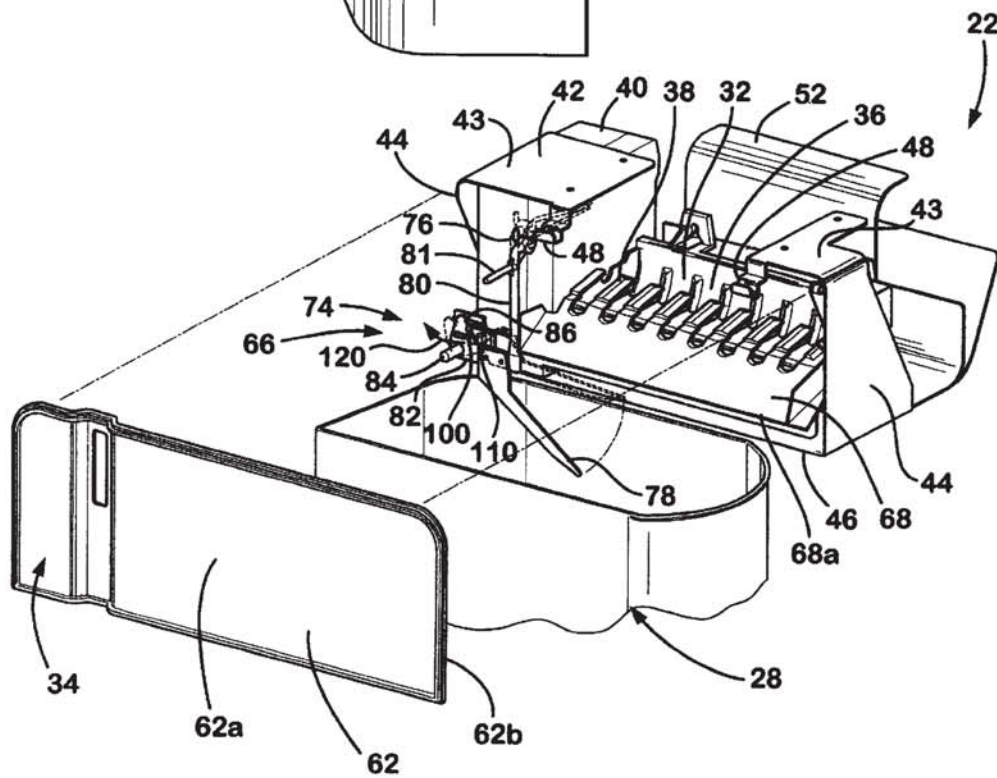


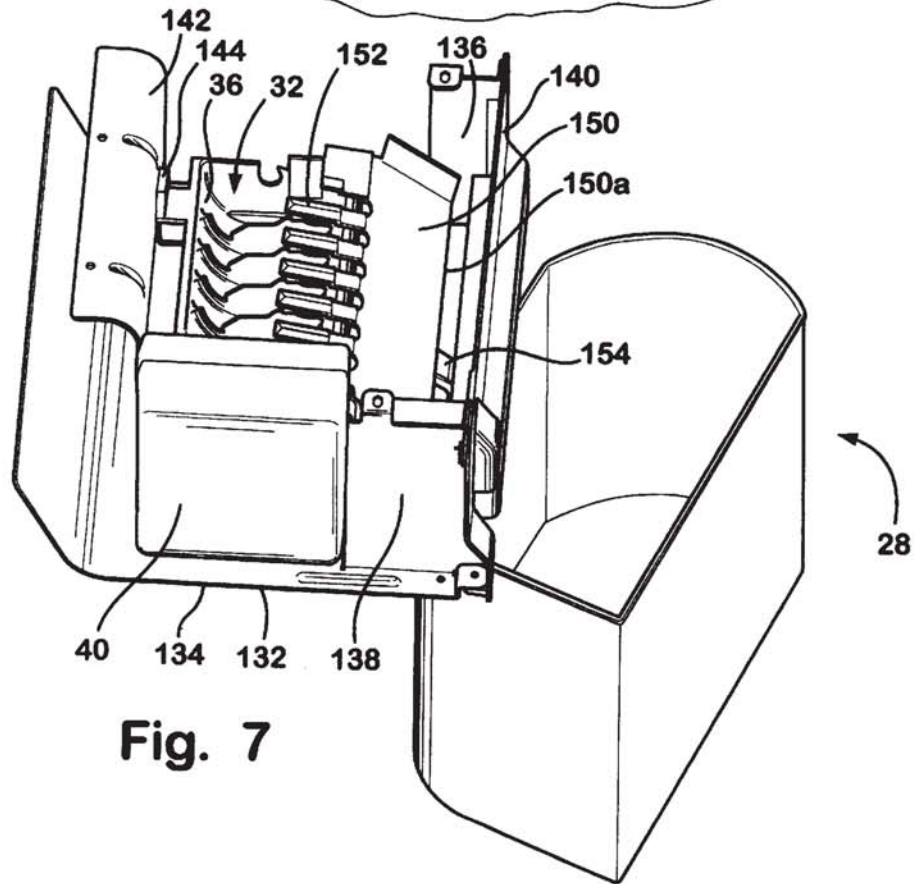
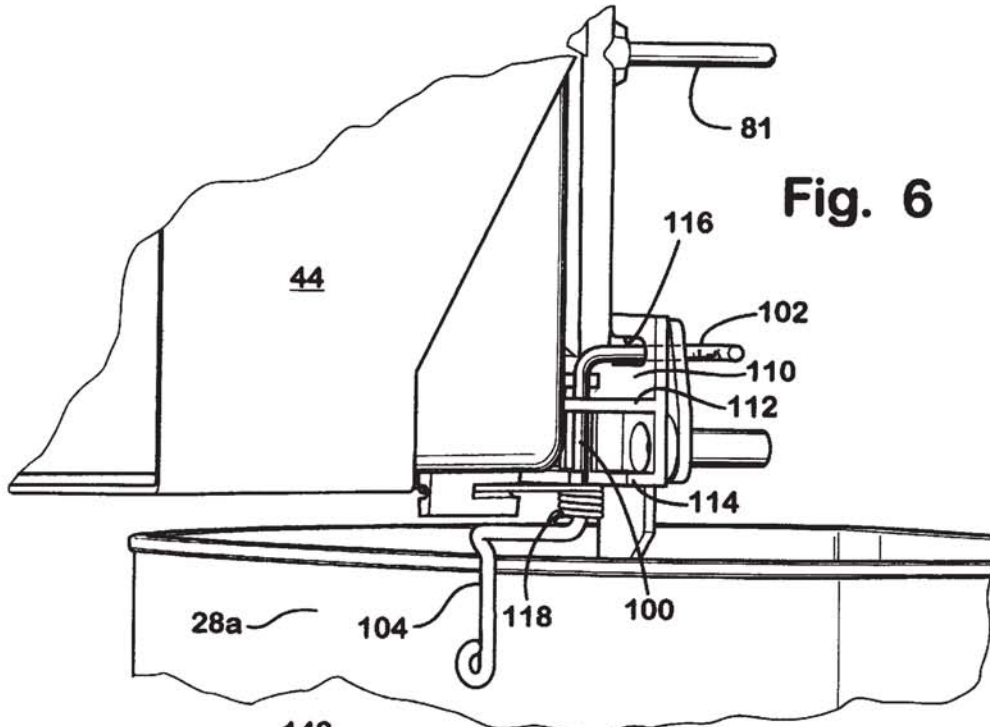
Fig. 5

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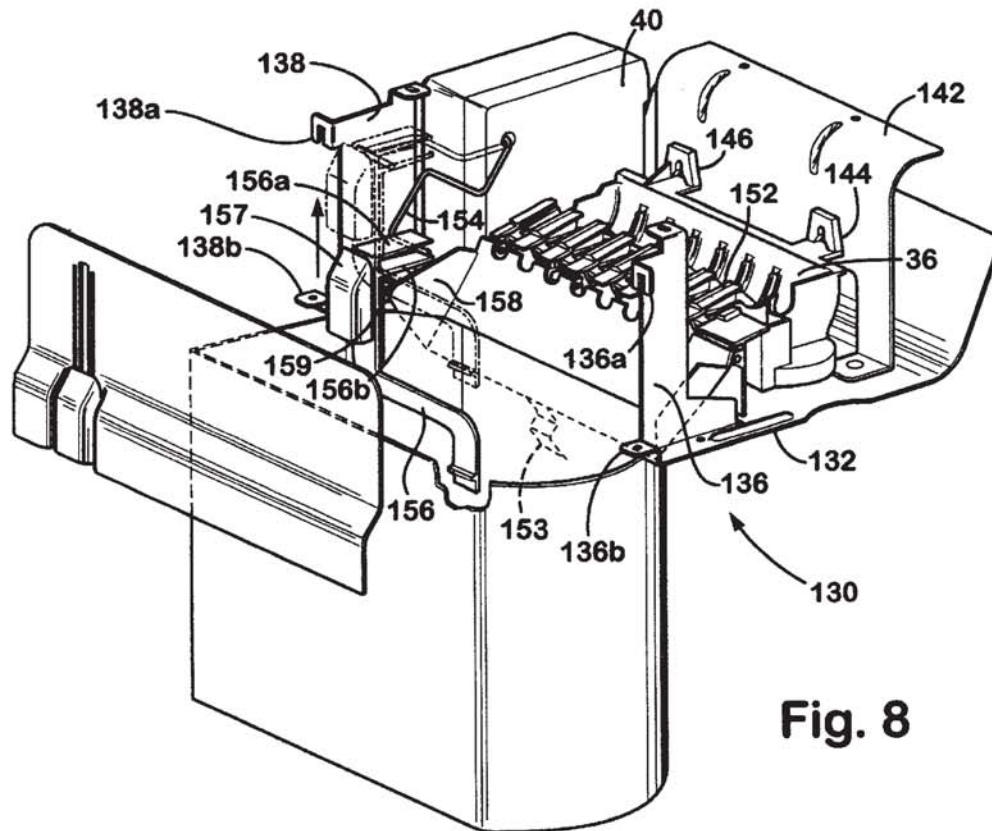


Fig. 8

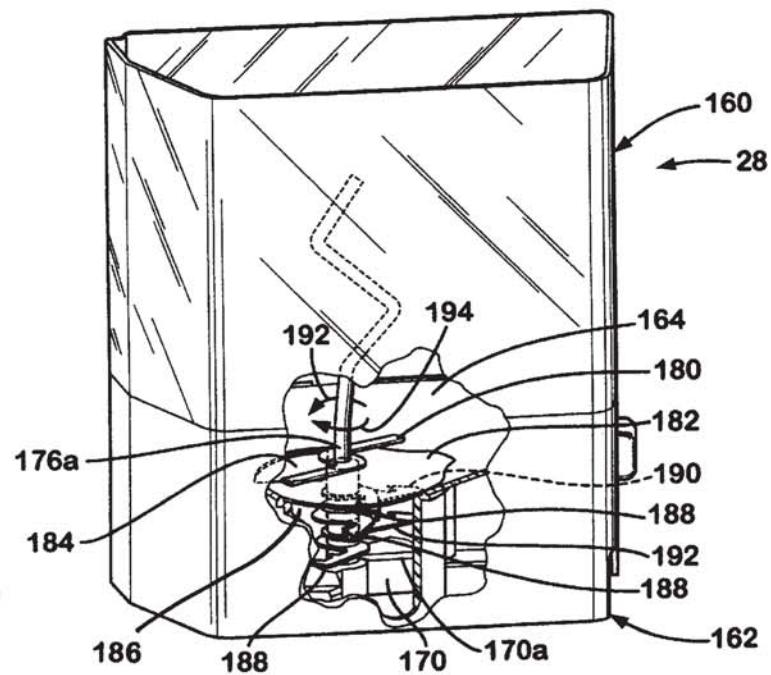


Fig. 9

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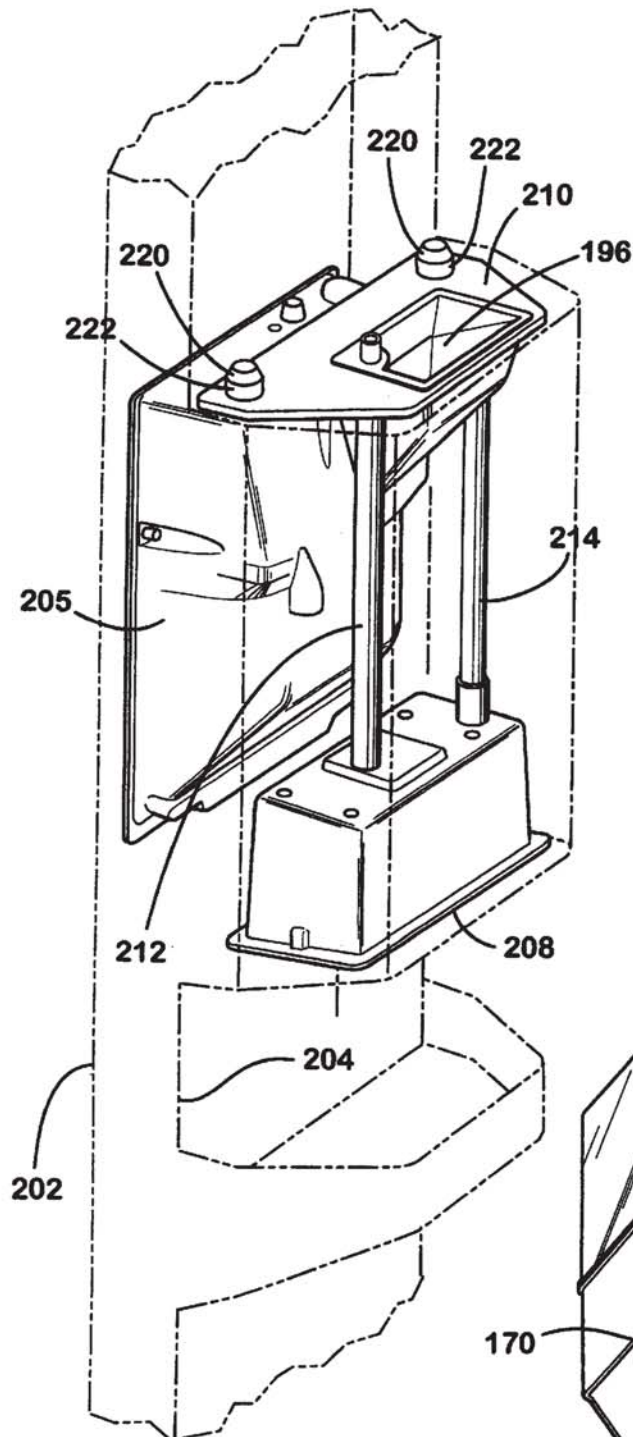
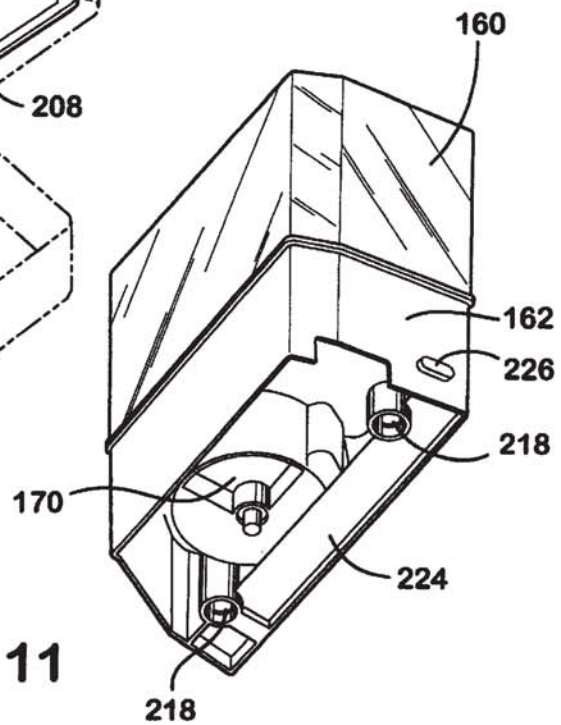


Fig. 10

Fig. 11



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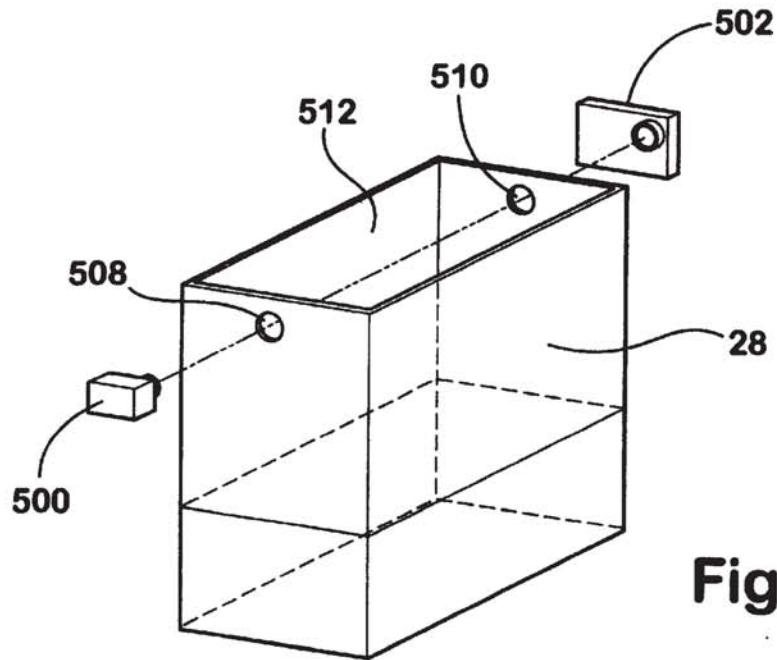


Fig. 12

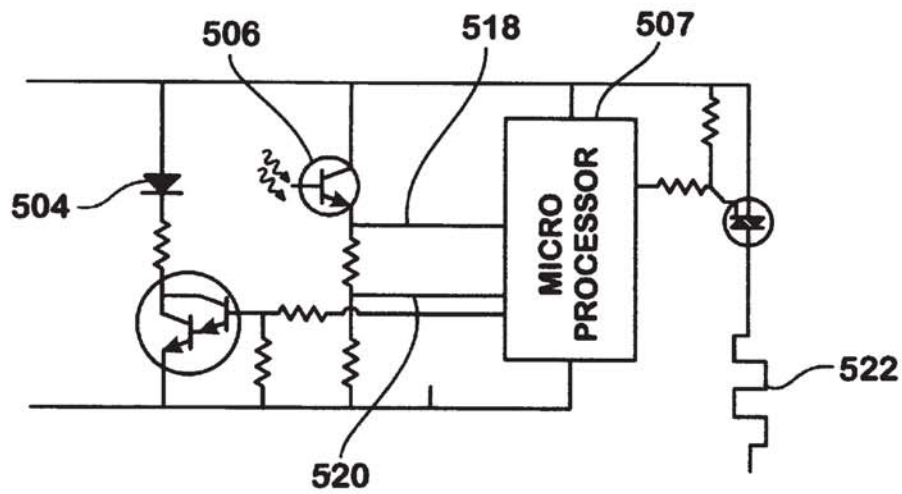


Fig. 13

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ICE DELIVERY SYSTEM FOR A REFRIGERATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to an ice making system for a refrigerator and more particularly to an ice delivery system mounted to a refrigerator closure member or door.

2. Description of Related Art

Automatic ice making systems for use in a home refrigerator are well known. Typically, ice making systems include an ice maker mounted within the freezer compartment of the refrigerator and an ice storage receptacle or bin supported beneath the ice maker for receiving the formed ice from the ice maker. The ice maker is commonly mounted within the freezer compartment adjacent the side or rear wall of the freezer compartment such that water and power can be readily supplied to the ice maker. The ice storage receptacle is generally supported by a shelf structure beneath the ice maker within the freezer compartment. U.S. Pat. No. 4,942,979, to Linstromberg et al. is an example of a prior art ice making system.

Ice making systems may also include ice delivery systems for automatically delivering ice pieces or bodies from the ice storage bin to a dispensing position or space provided on the external surface of the refrigerator. Conveying means, conventionally in the form of horizontally arranged augers disposed within the ice storage receptacle, have been used for transferring ice pieces from the ice storage bin through an opening provided in the freezer compartment door such that ice pieces may be automatically dispensed.

Illustratively, U.S. Pat. No. 4,084,725, to Buchser, discloses an ice dispensing apparatus for use in a domestic refrigerator having an ice maker and an ice storage receptacle mounted within a freezer compartment. The ice storage receptacle extends across the freezer compartment and has a front end adjacent the freezer door. As illustrated, a wire auger is horizontally positioned within the bottom of the ice storage receptacle and is selectively rotated by a motor when ice dispensing is desired. Ice cubes are delivered from the storage receptacle to an external service area in the freezer door by means of a rotatable tubular drum having an internal helical auger blade. The tubular drum is mounted to the end of the wire auger. When the wire auger and tubular drum are rotated, ice pieces are moved horizontally forward in the ice storage receptacle to fall into a chute for passing the ice pieces through the freezer door to the service area.

Another ice dispensing apparatus is illustrated in U.S. Pat. No. 4,176,527, to Linstromberg et al., which discloses an ice dispensing apparatus for use in a domestic refrigerator having an ice maker and an ice storage receptacle wherein ice pieces are delivered by a delivery means from the ice storage receptacle to an external service area either in the form of crushed ice or integral whole ice pieces. As shown, the ice maker and ice storage receptacle are mounted within the freezer compartment of the refrigerator. The ice storage receptacle extends across the freezer compartment and has a front end adjacent the freezer door. The transfer means comprises a rotatable wire auger horizontally disposed within the bottom of the ice storage receptacle. The wire auger has mounted at its distal end an auger blade. A motor is supported along the back wall of the freezer compartment and is drivably connected to the wire auger. When the motor is energized, the wire auger conveys ice pieces horizontally forward toward the auger blade such that ice pieces are supplied into a delivery chute wherein ice pieces are passed

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through the freezer door to the external service area. An ice crushing system may be selectively engaged such that the ice pieces may be crushed prior to delivery to the chute.

As can be seen in all of the above mentioned patent references, one aspect of conventional ice making and dispensing systems is that they occupy a relatively large amount of freezer shelf space. In particular, the ice storage bin extends across the freezer compartment and occupies a large amount of freezer compartment space. This is perceived as a disadvantage by many consumers who generally prefer to have more available shelf space. Accordingly, it would be an improvement to provide an ice making system which occupied less freezer shelf space.

Another disadvantage of prior art ice making and delivery systems is that a relatively large motor is required to rotate the ice conveying auger which is commonly provided. The motor size is related to the force necessary to break up frozen ice and move ice pieces horizontally forward within the ice receptacle.

Another disadvantage of the prior art is that the amount of ice in the ice storage receptacle is not readily visually apparent. Moreover, conventional ice making systems having automatic ice dispensing systems do not allow for easy removal of the ice storage receptacle and bulk removal of ice pieces.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a refrigerator having a cabinet defining a freezer compartment having an access opening and a closure member for closing the access opening. An ice maker is disposed within the freezer compartment for forming ice pieces and an ice storage bin is removably mounted to the closure member below the ice maker for receiving ice from the ice maker. The ice storage bin has an upper portion which is transparent and has a bottom opening. An ice discharge chute extends through the closure member below the bottom opening of the ice storage bin. A motor is mounted on the closure member. An auger is vertically disposed within the ice storage bin and is drivably connected to the motor. Upon energization of the motor, the auger moves ice pieces from the ice storage bin through the bottom opening to the ice discharge chute for dispensing ice pieces from the ice storage bin.

The ice storage bin may define an ice crushing region through which the ice pieces must pass when ice pieces are discharged through the bottom opening. The ice crushing region has an inlet opening. The auger has a shaft portion passing through the ice crushing region. At least one ice crusher blade is rotatably connected to the shaft portion for rotation within the ice crushing region. At least one stationary blade is mounted within the ice crushing region such that the ice crusher blade rotates past the stationary blade. When the motor is rotated in a first direction the ice pieces are crushed by the ice crusher blade and stationary blade prior to being dispensed through the chute and when the motor is rotated in a second direction whole ice pieces are dispensed through the ice chute.

The closure member of the present invention is a door including an inner liner, an outer wrapper and a foam material therebetween. A mounting plate is connected to the inner liner. The ice discharge chute extends through the door adjacent the mounting plate. A cup shaped support member is connected to the inner liner below the mounting plate. The ice storage bin is removably mounted to the mounting plate for receiving ice pieces. The motor is supported by the

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support member below the ice storage bin and the motor drive shaft extends from the support member to the mounting plate. The foam material is added to the door after the inner liner, outer wrapper, mounting plate and support member have been assembled such that the foam bonds to these components and secures them into position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of a refrigerator apparatus having an ice storing and dispensing system embodying the present invention;

FIG. 2 is a fragmentary perspective view illustrating the ice storing and dispensing system within the freezer compartment of the refrigerator apparatus with the freezer door open;

FIG. 3 is a fragmentary, side sectional view of the ice storing and dispensing system of FIG. 1;

FIG. 4 is a fragmentary, perspective view of a first embodiment of the ice storage and dispensing system of the present invention;

FIG. 5 is a fragmentary, perspective view of the first embodiment of the ice storage and dispensing system of the present invention wherein the front cover of the ice maker has been removed;

FIG. 6 is a fragmentary, enlarged perspective view of the first embodiment of the ice storage and dispensing system of the present invention wherein the front cover has been removed, illustrating the bin lever and associated components;

FIG. 7 is a fragmentary, perspective view of a second embodiment of the ice storage and dispensing system of the present invention, illustrating the freezer door partially open;

FIG. 8 is a fragmentary, perspective view of the second embodiment of the ice storage and dispensing system of the present invention wherein the front cover has been removed, illustrating the freezer door in a closed position;

FIG. 9 is a fragmentary, enlarged, perspective view of the ice storage bin with a cut away portion illustrating the ice crusher assembly;

FIG. 10 is an enlarged, perspective view of the components of the ice storage and dispensing system of the present invention which are mounted to the freezer door wherein the freezer door liner, wrapper and insulation have been removed; and

FIG. 11 is an enlarged, perspective view of the bottom of the ice storage bin of the ice storage and dispensing system of the present invention.

FIG. 12 is a simplified, elevational view of the ice storage bin and the optical ice level sensing system.

FIG. 13 is a schematic electrical diagram illustrating the circuitry of the optical ice level sensing system of FIG. 12.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the illustrative embodiment of the invention as shown in FIGS. 1-3, a refrigerator 10, comprising a side-by-side fresh food/freezer configuration, is provided having a cabinet 12 forming an above freezing fresh food compartment 14 and a below freezing freezer compartment 16. Both the fresh food compartment 14 and the freezer compartment 16 are provided with access openings. A fresh food closure member or door 18 and a freezer closure member or door 20 are hingedly mounted to the cabinet 12 for closing the access openings, as is well known.

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An ice making assembly 22 is disposed within the freezer compartment 16. The ice making assembly 22 is mounted to the inside surface of the top wall 24 of the freezer compartment 16. An ice dispensing system 26, mounted to the freezer door 20, is provided below the ice making assembly 22 for receiving ice pieces therefrom. The ice dispensing system 26 includes an ice storage receptacle or bin 28 having an ice crushing system 30. When operated, the ice dispensing system 26 transfers ice pieces from the bin 28 through the freezer door 20 whereby ice pieces may be dispensed through a conventional, forwardly exposed ice dispenser station or external ice service area 31.

A first embodiment of the ice making assembly 22 can be described in greater detail by referring now to FIGS. 4 and 5. The ice maker assembly 22 generally comprises an ice maker 32 and an ice discharge assembly 34. The ice maker 32 is a conventional ice piece making apparatus which forms crescent shaped ice pieces. The ice maker 32 includes an ice mold body 36, an ice stripper 38, a rotatable ejector (not shown) and a housing 40. The housing surrounds a drive motor and drive module (not shown) which operate to rotate the ejector (not shown) when ice harvesting is necessary. The ice maker disclosed in U.S. Pat. No. 4,649,717, herein incorporated by reference, is illustrative of the type of ice maker used in the present invention.

The ice maker 32 is supported by a mounting bracket 42 along the upper, front portion of the freezer compartment 16. The mounting bracket 42 is attached to the top wall 24 (FIG. 3) of the freezer compartment and forms a member having a generally U-shaped cross section. The bracket 42 includes top mounting surfaces 43 which attach to the top wall 24. Side walls 44 extend downwardly along the sides of the ice maker 32. A bottom wall 46 joins the side walls 44 and forms a heat shield beneath the bottom of the ice maker 32. Downwardly directed tabs 48 depend from the top mounting surfaces 43. The ice maker 32 is attached to the mounting bracket 42 via mounting legs (not shown). An air baffle member 52 is connected to the back of the ice maker 32 and acts to direct the flow of air within the freezer compartment 16 across the ice mold 36 as will be further discussed hereinafter.

The ice discharge assembly 34 is designed to prevent ice harvesting when the ice storage bin 28 is full of ice pieces. The need for this function is well recognized in the ice maker art. If ice harvesting is not appropriately controlled, the ice maker 32 may make an excessive quantity of ice and overflow the ice storage receptacle 28. In addition to limiting the quantity of ice produced, the ice discharge assembly 34 operates to control the discharge of ice pieces from the ice maker 32 such that ice pieces are not discharged when the freezer door 20 is open. If ice pieces are discharged when the door 20 is open, the ice pieces will fall onto the floor since the ice storage bin 28 is mounted on the door 20. To achieve these dual purposes, the ice discharge assembly 34 includes a front cover 62, a latching mechanism 64 and an ice level sensing mechanism 66 which operate together to achieve the above describe functions.

The ice stripper 38 includes a ramp 68 for directing harvested ice into the ice storage bin 28. The ramp 68 may be integrally formed with the ice stripper, as shown, or may be a separate member. The front cover 62 is pivotably supported by the tabs 48 in front of the ice maker 32. The front cover 62 is a generally flat member having a front surface 62a and a back surface 62b. The front cover includes a pair of support extensions 70 extending from the back surface 62b which are rotatably captured by the tabs 48 and allow the cover 62 to swing or pivot freely as long as the

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latching mechanism 64 is not engaged. The ramp 68 is angled downwardly and forwardly toward the back surface of the front cover 62. A bottom terminal edge 68a of the ramp 68 is disposed adjacent the back surface of the cover 62 wherein a small gap separates the bottom edge 68a and the back surface 62b of the cover 62.

When ice pieces are ready to be harvested from the ice mold body 36, the ejector and stripper 38 cooperate to remove ice pieces from the mold body 36 and urge the harvested ice pieces to slide forwardly along the stripper 38. The ice pieces slide forward off the stripper 38 and are directed to slide down the ramp 68. The spacing between the back wall of the cover 62 and the bottom edge 68a of the ramp 68 is such that ice pieces are not able to fit through the elongated gap which separates the ramp 68 and the cover 62. Accordingly, ice pieces sliding down the ramp 68 make contact with the cover 62. However, the mass of the ice pieces and the slope of the ramp 68 is such that the ice pieces push the cover 62 forward upon contact, rotating the cover 62 about the tabs 48, wherein the ice pieces are able to fall into the storage bin 28.

As mentioned above, the ice discharge assembly 34 serves to prevent overfilling of the ice storage receptacle by sensing the level of ice in the ice storage bin 28 and to prevent ice discharge when the door 20 is open. The ice level sensing mechanism 66 of the first embodiment of the ice discharge assembly, shown in FIGS. 4, 5 and 6, operates to prevent overfilling of the bin 28. The ice level sensing mechanism 66 includes a shut-off arm 76 extending from the housing 40. The shut-off arm 76 is lifted by a cam located within the housing 40 prior to and during the harvesting of ice cubes. The actuation of the shut-off arm 76 is described in U.S. Pat. No. 5,160,094 which is herein incorporated by reference.

The shut-off arm 76 is connected to a sensing finger 78 through a connecting rod 80. The finger is connected to base 82 or alternatively, the base 82 and finger may be one integral part. The base 82 is pivotally supported by a pin 84. As shown, the connecting rod 80 is rotatably connected to the shut-off arm 76 and the base 82 to allow for rotational motion of the finger 78 about the pin 84. Thus, as the shut-off arm 76 is raised during the ice harvesting cycle, the finger 78 is pivotally raised out of the storage bin 28. Once the ice pieces are harvested and have fallen into the bin 28, the finger 78 is lowered back into the bin 28.

When a sufficient amount of ice pieces have been delivered to the ice storage bin 28 so as to cause the level therein to rise to a preselected full level, the operation of the ice maker 32 will be interrupted by preventing the shut-off arm 76 from returning to its normal position. This occurs when the finger 78 contacts ice pieces when it is lowered back into the ice storage bin 28 such that it is prevented from fully descending into the bin 28. The ice maker operation will be interrupted until such time as the level of ice pieces in the bin 28 is lowered as by removing some or all of the ice bodies therein. When this occurs, the finger 78 is allowed to fully descend into the bin 28 permitting the shut-off arm 76 to return to its normal position wherein the ice maker operation is resumed. A lever 81 extends from the connecting rod through the front cover 62 to allow a user to manually deenergize the ice maker 32 by lifting the shut-off arm 76 via the lever 81.

As can be readily appreciated from the above description, every time the freezer door 20 is opened, the ice storage bin 28, being mounted on the door 20, is removed from beneath the ice making assembly 22. Accordingly, it is necessary to completely lift the ice level sensing finger 78 out of the ice

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storage bin 28 when the freezer door 20 is opened. Failure to lift the finger 78 out of the bin 28 when the door 20 is open could result in damage to the finger 78 and to the entire ice level sensing system 66.

FIG. 6 in combination with FIGS. 5 and 6 illustrate the mechanism used to lift the finger 78 out of the bin 28 when the door 20 is opened. A bin lever 100 is rotatably supported adjacent the rear wall 28a of the bin 28. The bin lever 100 is preferably a wire member having an upper latching portion 102 and a lower bin engagement portion 104 joined by a center portion. As shown in the FIG. 6, the bin lever 100 may be supported by a side extension portion 110 extending from the main body of the ramp 68. The bin lever 100 is snap fit into a pair of slotted openings provided on a support walls 112 and 114 which extend from the side extension 110. The upper latching portion 102 extends forwardly through a guide slot 116 formed into the side extension 110. The guide slot 116 ensures the proper vertical orientation of the upper latching portion 102 of the bin lever 100. It should be noted that the bin lever 100 could be supported in other ways, such as by structure extending from the housing 40.

A spring 118 engages the bin lever 100 and biases it to rotate clockwise when viewed from above, as shown by arrow 120, such that the bin engagement portion 104 is biased toward the rear wall of the bin 28a. When the door 20 is closed, the rear wall 28a of the bin 28 engages the bin engagement portion 104 winding the spring 118 and causing the bin lever 100 to rotate counterclockwise, opposite of the arrow 120. However, when the door 20 is opened, the bin lever 100 is free to rotate clockwise until the latching portion 102 engages the base of the guide slot 116.

As described above, the finger 78 is connected to the base 82 and the base is pivotally supported about the pin 84. The pin 84 extends outwardly from the side extension 110. Accordingly, lowering and raising the finger 78 is accomplished by rotating the finger about the pin 84. The base has a ramp surface 86. The ramp surface 86 is positioned within the travel of the latching portion 102 of the bin lever 100. When the door 20 is closed, the bin lever is rotated to a position which allows the finger to descend into the bin 28. However, when the door 20 is opened, the clockwise rotation of the bin lever 100 causes the latching portion 102 to engage the ramp surface 86, rotating the finger 78 up out of the bin 28. In this manner, whenever the door 20 is opened the finger 78 is lifted completely clear of the bin 28. To further ensure that damage does not occur to the finger 78 when the freezer door 20 is opened, the finger 78 may be formed from flexible plastic or elastomeric material such that finger 78 will flex if forced into contact with the bin 28.

The lifting of the finger 78, caused by the sliding engagement between the ramp surface 86 and the latching portion 102, also lifts the connecting rod 80 and the shut-off arm 76 such that the ice maker 32 is deenergized, preventing ice harvesting when the door 20 is open, thereby preventing ice from falling from the ice discharge assembly 34 when the door 20 is open.

The latching mechanism 64 further provides a means for preventing ice from falling from the ice discharge assembly 34 when the door 20 is open. The latching mechanism 64 operates to secure the front cover 62 in a closed position when the door 20 is open. The front cover 62 includes a catch 88 which extends from the back surface 62b. The catch 88 is positioned adjacent the latching portion 102 of the bin lever 100. As described above, when the door 20 is opened, the bin lever 100 rotates clockwise, as shown by arrow 120. This rotation of the bin lever 100 causes the latching portion

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102 to rotate into a position wherein the latching portion engages the catch 88 thereby preventing the cover 62 from pivoting about the tabs 48. Accordingly, whenever the door 20 is open, the bin lever 100 rotates to a position wherein the cover 62 is latched closed. When the cover 62 is latched closed, the gap between the back surface 62b and the bottom edge 68a of the ramp is insufficient for ice pieces to pass therebetween. Thus, any ice pieces which are on the ice stripper 38 or ramp 68 when the door 20 is opened are prevented from falling out of the ice discharge assembly 34 until the door 20 is again closed.

While the bin lever 100 is shown rotatably supported about a vertical axis, it can be readily understood that the bin lever could be rotatably supported about a horizontal axis. Moreover, the bin lever could be operated to lift an ice sensing finger which is slidably supported above the ice storage bin rather than an ice sensing finger which is rotatably supported.

FIGS. 7 and 8 disclose an alternative embodiment ice discharge assembly 130. In this embodiment, the ice maker 32, which is similar to the first embodiment, is supported by mounting bracket 132. The mounting bracket 132 includes a bottom shield portion 134 positioned below the ice maker 32. A pair of arms 136, 138 extend upwardly from the bottom shield portion toward the top wall 24 (FIG. 3) of the freezer compartment and provide means for rigidly mounting a front cover 140. As shown, the connection means for the front cover may include a pair of slotted tabs 136a, 138a and a pair of tabs 136b, 138b. A rear air deflector 142 also extends upwardly from the bottom shield portion 134. Both the arms 136, 138 and the rear air deflector 142 mount to the top wall 24 of the freezer compartment. The ice maker 32 is mounted to the rear air deflector 142 by a pair of mounting feet 144, 146.

A rotatable ramp 150 is connected to the ice maker 32 and may preferably be pivotably connected to an ice stripper 152. However, the ramp 150 may be pivotably connected to other ice maker components such as the ice mold. The ramp 150 is biased to rotate upwardly toward a horizontal position. The ramp 150 is preferably biased by a spring (not shown) which is between the ramp 150 and the ice maker 32. An arm portion 153 extends downwardly and outwardly from the ramp 150 and engages the ice storage bin 28 when the door 20 is closed. In this manner, as the door 20 is closed and the ice storage bin 28 is positioned beneath the ice making assembly 22, the bin 28 engages the arm 153 and rotates the ramp 150 approximately 70° into a downward position.

The ramp 150 includes a bottom terminal edge 150a. When the ramp 150 is rotated into its horizontal position, due to the door 20 being open, the terminal edge 150a is positioned adjacent the back of the front cover 140 such that any ice that is dispensed from the ice maker 32 is trapped between the ramp 150 and the front cover 140. In this manner, ice can not be discharged from the ice discharge assembly 130 when the door 20 is open. When the ramp 150 is rotated down, due to the door 20 being closed, the bottom edge 150a is moved away from the front cover 140 such that ice pieces can slide down the ramp 150 and fall into the ice storage bin 28.

In addition to preventing the discharge of ice when the freezer door 20 is open, the ice discharge assembly serves to prevent overfilling of the ice storage bin 28 by sensing the level of ice in the bin 28. To that end, a shut-off arm 154 is provided extending from the housing 40. The shut-off arm 154, similar to the shut-off arm 76, is lifted by a cam located

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within the housing 40 prior to and during the harvesting of ice cubes. The actuation of the shut-off arm 154 is described in U.S. Pat. No. 5,160,094 which was previously incorporated by reference.

The shut-off arm is a wire member having a terminal portion which is drivingly connected to an ice sensing finger 156. In particular, the terminal portion of the shut-off arm 154 is disposed between a pair of horizontal walls 156a, 156b extending from the upper end of the ice sensing finger 156. The ice sensing finger 156 is slidably supported by the front cover 140 for vertical movement and has a bottom portion which extends down into the ice storage bin 28. During ice harvesting from the ice maker 32, the shut-off arm 154 lifts the ice sensing finger 156 up out of the bin 28 and then lowers the finger 156 back into the bin. When a sufficient amount of ice pieces have been delivered to the storage bin 28 so as to cause the level therein to rise to a preselected full level, the operation of the ice maker 32 will be interrupted by preventing the shut-off arm 154 from returning to its normal position. In addition to deenergizing the ice maker in response to the ice level sensing operation, a knob 157 extends from the finger 156 through the front cover 140 to allow a user to manually deenergize the ice maker 32 by lifting the shut-off arm 154 via the knob 157.

The motion of the rotatable ramp 150 during the opening of the freezer door 20 also acts to lift the finger 156 out of the bin 20 when the door 20 is opened, thereby preventing damage to the finger 156. The ramp 150 includes a side wall 158 having a rod-like extension 159. The extension 159 is disposed beneath the wall 156b of the finger 156. Upon opening the door 20, the ramp 150 rotates upwardly wherein the extension 159 engages the wall 156b and raises the finger 156 and rotates the shut-off arm up from its normal position. In this manner, the ice maker 32 is deenergized, preventing ice harvesting when the door 20 is open and thereby preventing ice pieces from falling from the ice discharge assembly 130 when the freezer door 20 is open. To further ensure that damage does not occur to the finger 156 when the freezer door 20 is opened, the finger 156 may be formed from flexible plastic or elastomeric material such that finger 156 will flex if forced into contact with the bin 28.

In the ice discharge assembly 34 of the first embodiment, shown in FIGS. 4-6, and the ice discharge assembly 130 of the second embodiment, shown in FIGS. 7 and 8, the mechanical ice level sensing systems may be replaced by an electronic optical system as shown in FIGS. 12 and 13. In an optical ice level sensing system, light (electromagnetic radiation of any wavelength) is used to sense the presence of ice pieces. An optical ice level sensing system takes advantage of the fact that ice pieces formed by a conventional ice maker, as described above, have a cloudy core which is due to air bubble entrapment, crazing during the freezing process, and water impurities among other things. This cloudy core of the ice pieces blocks a wide range of wave lengths that are generated and sensed by many standard infrared (IR) radiation products.

As shown in FIGS. 12 and 13, an optical ice level sensing system includes a light emitter 500 and receiver 502. The emitter 500 may be a printed circuit board (PCB) having a IR photo diode 504 which emits an IR light while the receiver may be a photo transistor 506 mounted to a PCB along with a microprocessor 507 and the necessary electronic circuitry to operate the optical ice level sensing system. The microprocessor 507 controls the operation of the ice level sensing system. The emitter 500 may be mounted to a side wall of the freezer compartment 16 adjacent the top of the ice storage bin 28 while the receiver

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502 is mounted to the side wall of the freezer compartment 16 opposite from the emitter. A pair of openings 508 and 510 are disposed in the ice storage bin 28 near the top surface of the bin 28 such that a line of sight or clear path 512 is created between the emitter and the receiver.

During operation of the optical system, IR radiation is generated by the emitter 500 which is directed to pass along the path 512 through the ice storage bin 28 to be received by the receiver 502. As discussed above, ice pieces, due to there cloudy core, will impede the transmission of the IR radiation such that the level of the level the IR signal received by the receiver can be used as an indicator of the ice level. When the IR photo diode 504 is pulsed, if the photo transistor 506 senses an IR signal, this indicates that the ice bin 28 is not completely filled with ice and the ice maker 32 will be operated to produce and harvest more ice pieces. If the photo transistor 506 does not sense an IR signal when the emitter 500 is pulsed, this indicated that the ice bin 28 is full of ice pieces and further ice will not be harvested.

One problem with an optical ice level sensing system is that ice can coat the photo diode 504 and the photo transistor 506 such that sending and receiving IR signals is impaired. The signal may be degraded to a point where the optical system provides a false full ice bin signal when in fact the ice storage bin is not full of ice pieces. This occurs particularly quickly when the refrigerator is operated in a hot and humid location wherein when the freezer door 20 is opened, moisture immediately condenses onto the cold surfaces within the freezer compartment 16.

This degradation can be sensed and distinguished from a normal situation as shown in FIG. 13. The microprocessor 507 receives signal 1 across line 518 and signal 2 across line 520. With clean optics, both signal 1 and 2 are read as a logic level "1" when the bin is empty and a logic level "0" when the bin is full. At some point during the degradation process, the lesser voltage at signal 2 will fall below the microprocessor input threshold and be read as a logic level "0" while the greater signal 1 is still large enough to be read as a logic level "1". Whenever signals 1 and 2 differ, ice build up has occurred and it is necessary to clean the optic system.

Heater resistors are shown as 522 which are used to clean the optics system. The heaters are physically located adjacent the photo transistor 506 and the photo diode 504. When optic cleaning is necessary, the heaters 522 are energized to warm the photo transistor 506 and the photo diode 504 such that the accumulated ice is melted away.

Turning now back to FIGS. 2 and 3, the ice dispensing system 26 can be further explained. The ice storage bin 28 is mounted to the freezer door and includes an upper ice bin member 160 and a lower ice bin member 162. The upper ice bin member 160 is formed from a clear plastic material such that the quantity of ice pieces stored within the ice bin 28 is easily visually determined. The lower ice bin member 162 is rigidly connected to the upper ice bin member 160 and includes a funnel wall portion 164, a cylindrical wall portion 166 and a bottom wall portion 168. The bottom wall portion 168 includes an ice outlet opening 170 through which the ice pieces must pass to be dispensed.

Rotatably supported within the ice bin 28 is an auger 172 having a shaped upper end 174 and a bottom shaft 176. The upper end 174 is supported within the upper ice bin member 160 and is designed to break up any large clumps of ice pieces which may be formed when ice pieces partially melt and then refreeze. Accordingly, rotation of the auger 172 ensures that the ice pieces are free to move downwardly, under the urgings of gravity, though the lower ice bin

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member and the ice crushing system 30 such that ice pieces may be dispensed. The upper end 174 of the auger 172 is also configured to avoid pushing ice pieces up and over the rim of the upper ice bin member 160.

As best seen in FIGS. 3 and 9, the bottom shaft 176 of the auger 172 is disposed within the lower ice bin member. The bottom shaft 176 is provided with a flat surface such that various parts may be assembled to the shaft for co-rotation therewith. The upper end 176a of the bottom shaft 176 is positioned within the funnel wall portion 164 and the bottom end 176b of the bottom shaft 176 extends through the bottom wall for coupling to a drive shaft 178. The coupling between the drive shaft 178 and the bottom shaft 176 may be accomplished through use of a coupling member.

Drivingly connected to the upper end 176a of the bottom shaft 176 is a bridge breaker blade 180. The bridge breaker blade 180 rotates above a blade cover 182. The blade cover 182 is a plate which is attached to the lower ice bin member at the junction between the funnel wall portion 164 and the cylindrical wall portion 166. The cover 182, together with the funnel wall portion 164, forms a bottom wall of the upper ice bin member 160. An inlet opening 184 is formed into the cover 182 through which ice pieces must pass to be discharged. The inlet opening 184 is positioned 180° opposite of the outlet opening 170. As the auger 172 rotates, ice pieces are directed by the funnel wall portion 164 toward the inlet opening 184. The bridge breaker blade 180 ensures that the inlet opening 184 does not become jammed or bridged by ice pieces thereby preventing ice dispensing.

Once ice pieces pass through the inlet opening 184 they are disposed within a cylindrical ice crushing region 186 defined by the cylindrical wall portion 166, the cover 182 and the bottom wall portion 166. The bottom shaft 176 passes through the center of this region. Extending from the bottom shaft 176 are a plurality of ice crusher blades 188. The ice crusher blades 188 are connected to the bottom shaft for co-rotation therewith. A plurality of stationary blades 190 extend between the bottom shaft 176 and the cylindrical wall portion 166. The stationary blades 190 are positioned adjacent the side edge 170a of the ice outlet opening.

Rotation of the auger 172 causes the ice pieces to pass through the inlet opening 184 and fall into the ice crushing region 186. If the auger 172 is rotated counterclockwise, as shown by arrow 192, the ice pieces within the crushing region 186 are swept by the ice crushing blades 188 from the inlet opening 184 around within the crushing region 186 to fall through the outlet opening 170. The ice pieces move from the inlet opening 184 to the outlet opening 170 without having to pass through the stationary crusher blades. In this manner, when the auger 172 is rotated in the direction of arrow 192, whole ice pieces are dispensed though the outlet opening 170 and no ice crushing occurs.

If the auger 172 is rotated clockwise, as shown by arrow 194, the ice pieces within the crushing region 186 are swept by the ice crushing blades 188 from the inlet opening and are driven into the stationary ice crushing blades 190. The rotation of the auger 172 rotates the blades 188 past the stationary blades 190 resulting in the ice pieces being crushed. The crushed ice pieces, once past the stationary blades 190, fall through the outlet opening 170. In this manner, when the auger 172 is rotated in the direction of arrow 194, crushed ice pieces are dispensed though the outlet opening 170. Once the ice pieces, in either a whole or crushed form, are passed through the ice outlet opening 170, they fall through a chute 196 formed into the freezer door 20 to a waiting receptacle positioned within the service area 31.

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While the dispensing of the ice pieces have been described with regard to the use of a plurality of crusher blades 188, the invention could readily be practiced with just one crusher blade 188 and one stationary blade 190. Moreover, the invention could dispense ice from the ice storage bin 28 without use of rotating and stationary crushing blades. For example, the rotary blades 188 and stationary blades 190 could be omitted and replaced with a paddle or other valving devices such as a pivotable or rotary door.

As just described, rotation of the auger 172 and the associated ice crusher blades 188 causes ice to be moved from the area of the upper ice bin member 160, through the ice inlet opening 184 and outlet opening 170 such that ice pieces are dispensed. The auger 172 is rotated by the drive shaft 178 which extends from a motor 200. The motor 200 is supported on the freezer door 20 below the ice service. The drive shaft 178 extends a relatively large distance between the motor and the ice bin 28.

To ensure proper operation of the ice delivery system of the present invention, it is important to rigidly and securely support the motor 200 and the ice bin 28 on the freezer door 20 since these parts must align for proper operation. The construction of the freezer door, as shown in FIG. 3, provides the necessary strength and rigidity. The freezer door 20 comprises a metallic outer wrapper 202, an inner liner 204 with a foam material 206 disposed between the wrapper 202 and the liner 204. The ice service area 31 is formed by a service housing 205 which attaches to an opening in the wrapper 202. The fabrication of the door 20 may be such that the foam material 206 is foamed in place between the wrapper 202, the liner 204 and service housing 205 and bonds to the inner surfaces of the wrapper 202, liner 204 and service housing 205 providing a great deal of strength and rigidity.

FIGS. 3 and 10 illustrate the components used to support the motor and the ice storage bin 28. The motor 200 is mounted to a bracket 207 within a cup-shaped support member or housing 208 which is connected to the inner liner 204 prior to the foaming operation. A motor cover plate 209 is placed over the open end of the housing 208 after the motor is assembled to the door. The ice bin 28 is mounted to a mounting plate 210 which is connected to the inner liner 204. A conduit 212 extends between the mounting plate 210 and the housing 208 through which the drive shaft 178 can extend. A wiring conduit 214 is also connected to the motor housing 208 and extends upwardly to connect to the housing 205. In this manner, wiring can be routed between the motor 200 and controls placed in the ice service area 31.

Accordingly, it can be understood that during fabrication of the freezer door 20, the housing 208, the mounting plate 210, the conduit 212 and the wiring conduit 214 are assembled to the inner liner 204 and then the foam 206 is foamed between the liner 204 and the wrapper 202 such that the components are bonded into position. Moreover, it can be readily appreciated by one skilled in the art that the conduits 212 and 214 may be integrally formed as part of the mounting plate 210 or the housing 208. Likewise, the mounting plate 210 or the housing 208 may be able to be integrally formed as part of the service housing 205.

One of the benefits of the present invention is that the ice bin 28 is removable from the freezer door. This allows a user to readily remove the ice bin 28 and dump a large quantity of ice into a receptacle such as an insulated cooler. FIGS. 10 and 11 best show how this is accomplished. The lower ice bin member 162 is provided with a pair of cylindrical bosses 218 or receptacles which correspond to mounting pins 220

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provided on the mounting plate 210. When the ice storage bin 28 is properly set upon the mounting plate 210, the receptacles 218 and pins 220 align. Moreover, when the bin 28 is properly placed on the plate 210, the drive shaft 178 is coupled with the auger 172 and the ice outlet 170 is disposed over the chute 196.

Means are provided for securing the bin 28 to the mounting plate 210. Each of the pins 220 are provided with an annular groove 222. A retention bar 224 is slidably supported by the lower ice bin member 162. A button 226, connected to the bar 224, is provided for longitudinally moving the retention bar 224 which is biased toward the button 226. The retention bar 224 has a pair of cut out portions (not shown) corresponding to the grooves 222. When the bin 28 is placed onto the mounting plate 210, the pins 220 are received into the receptacles 218 and the cut out portions of the retention bar 224 are engaged into the grooves 222 provided on the pins 220. When it is desired to remove the bin 28, the button 226 is depressed such that the cut out portions of the retention bar 224 are disengaged from the grooves 222, allowing separation between the plate 210 and the bottom bin member 162.

While the retention means are shown in the present description as a retention bar and a pair of pins, the present invention is not limited to this structure. For example, only one pin could be used. Moreover, the retention means could be something other than a pin and bar such as a hook and latch arrangement.

It can be seen, therefore, that the present invention provides a unique ice delivery system wherein the ice maker is located along the top wall of the freezer and the ice storage bin is mounted to the freezer door. A dispensing system including a motor is also supported on the freezer door. The present invention provides an ice storage bin which is a vertically elongated storage container with a vertically arranged auger disposed therein such that the dispensing of ice is readily accomplished. The ice storage bin is partially transparent which allows for the easy visual determination of the amount of ice in the storage bin. The present invention further provides a manner of assembling the ice storage bin and motor to the freezer door which is designed to provide adequate strength and rigidity.

While the present invention has been described with reference to the above described embodiment, those of skill in the Art will recognize that changes may be made thereto without departing from the scope of the invention as set forth in the appended claims.

We claim:

1. A refrigerator including a freezer compartment having an access opening and a closure member for closing the access opening, the refrigerator comprising:

an ice maker being disposed within the freezer compartment for forming ice pieces;

an ice storage bin mounted to the closure member below the ice maker for receiving ice from the ice maker, the ice storage bin having a bottom opening;

a motor mounted on the closure member; and

an auger disposed within the ice storage bin and drivably connected to the motor,

wherein upon energization of the motor, the auger moves ice pieces from the ice storage bin through the bottom opening for dispensing from the ice storage bin.

2. The refrigerator according to claim 1, further comprising:

an ice discharge chute through the closure member below the bottom opening of the ice storage bin wherein upon

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energization of the motor, the auger moves ice pieces from the ice storage bin through the bottom opening to the ice discharge chute.

3. The refrigerator according to claim 1, further wherein the auger is supported in a vertical orientation within the ice storage bin.

4. The refrigerator according to claim 1 further wherein the ice storage bin is at least partially formed out of a transparent material such that the amount of ice pieces in the ice storage bin can be readily visually determined.

5. The refrigerator according to claim 1 further comprising:

a breaker blade rotatably connected to the auger, the breaker blade being disposed within the ice storage bin adjacent the bottom opening of the ice storage bin.

6. The refrigerator according to claim 1 further wherein the ice storage bin comprises:

the ice storage bin defines an ice crushing region through which the ice pieces must pass when ice pieces are discharged through the bottom opening, the ice crushing region having an inlet opening;

the auger having a shaft portion passing through the ice crushing region;

at least one ice crusher blade rotatably connected to the shaft portion for rotation within the ice crushing region; and

at least one stationary blade mounted within the ice crushing region such that the ice crusher blade rotates past the stationary blade.

7. The refrigerator according to claim 6 further comprising:

a breaker blade rotatably connected to the auger, the breaker blade being disposed adjacent the inlet opening of the ice crushing region.

8. The refrigerator according to claim 1 further wherein the ice storage bin comprises:

an upper ice bin member having a bottom edge;

a lower ice bin member connected to the lower edge of the upper ice bin member, the lower ice bin member defining an ice crushing region through which the ice pieces must pass when ice pieces are discharge through the bottom opening;

the auger having a shaft portion passing through the ice crushing region;

at least one ice crusher blade rotatably connected to the shaft portion for rotation within the ice crushing region; and

at least one stationary blade mounted within the ice crushing region such that the ice crusher blade rotates past the stationary blade.

9. The refrigerator according to claim 1 wherein the ice storage bin is removable from the freezer compartment closure member.

10. A refrigerator including a cabinet for defining a freezer compartment having top wall and an access opening, the refrigerator comprising:

a closure member for closing the access opening;

an ice maker being disposed within the freezer compartment adjacent the top wall for forming ice pieces;

an ice storage bin removably mounted to the closure member below the ice maker for receiving ice from the ice maker, the ice storage bin having a bottom opening;

an ice discharge chute forming an opening through the closure member below the bottom opening of the ice storage bin;

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a motor mounted on the closure member; and

an auger vertically disposed within the ice storage bin and drivingly connected to the motor,

wherein upon energization of the motor, the auger moves ice pieces from the ice storage bin through the bottom opening to the ice discharge chute.

11. The refrigerator according to claim 10 further wherein the ice storage bin is formed out of a clear material such that the amount of ice pieces in the ice storage bin can be readily visually determined.

12. The refrigerator according to claim 10 further comprising:

a breaker blade rotatably connected to the auger, the breaker blade being disposed within the ice storage bin adjacent the bottom opening of the ice storage bin.

13. The refrigerator according to claim 10 further wherein the ice storage bin comprises:

the ice storage bin defines an ice crushing region through which the ice pieces must pass when ice pieces are discharged through the bottom opening, the ice crushing region having an inlet opening;

the auger having a shaft portion passing through the ice crushing region;

at least one ice crusher blade rotatably connected to the shaft portion for rotation within the ice crushing region; and

at least one stationary blade mounted within the ice crushing region such that the ice crusher blade rotates past the stationary blade,

wherein when the motor is rotated in a first direction the ice pieces are crushed prior to being dispensed through the chute and when the motor is rotated in a second direction whole ice pieces are dispensed through the ice chute.

14. The refrigerator according to claim 13 further comprising:

a breaker blade rotatably connected to the auger, the breaker blade being disposed adjacent the inlet opening of the ice crushing region.

15. The refrigerator according to claim 10 further wherein the ice storage bin comprises:

an transparent upper ice bin member having a bottom edge;

a lower ice bin member connected to the lower edge of the upper ice bin member, the lower ice bin member defining an ice crushing region through which the ice pieces must pass when ice pieces are discharge through the bottom opening, the ice crushing region having an inlet opening;

the auger having a shaft portion passing through the ice crushing region;

at least one ice crusher blade rotatably connected to the shaft portion for rotation within the ice crushing region; and

at least one stationary blade mounted within the ice crushing region such that the ice crusher blade rotates past the stationary blade,

wherein when the motor is rotated in a first direction the ice pieces are crushed prior to being dispensed through the chute and when the motor is rotated in a second direction whole ice pieces are dispensed through the ice chute.

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16. The refrigerator according to claim 10, further comprising:

a mounting plate connected to the closure member wherein the ice storage bin is removably mounted to the mounting plate for support on the closure member.

17. The refrigerator according to claim 16 further wherein:

the mounting plate includes at least one pin;

the ice storage bin includes at least one receptacle corresponding to the pin and a locking mechanism to secure the ice storage bin to the mounting plate.

18. A refrigerator including a cabinet defining a freezer compartment having an access opening, the refrigerator comprising:

a door hingedly mounted to the cabinet for closing the access opening, the door including an inner liner, a outer wrapper and a foam material therebetween;

a mounting plate connected to the inner liner;

an ice discharge chute extending through the door adjacent the mounting plate;

a support member connected to the inner liner below the mounting plate;

an ice storage bin removably mounted to the mounting plate for receiving ice pieces, the storage bin having a bottom opening;

a motor supported by the support member below the ice storage bin, the motor having a drive shaft extending from the support member to the mounting plate; and

an auger rotatably disposed within the ice storage bin for coupling with the drive shaft wherein upon energization of the motor, the auger moves ice pieces from the ice storage receptacle through the bottom opening to the ice discharge chute.

19. The refrigerator according to claim 18 further comprising:

an ice maker mounted within the freezer compartment for delivering ice pieces to the ice storage bin.

20. The refrigerator according to claim 18 wherein the foam material is added to the door after the inner liner, outer

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wrapper, mounting plate and support member have been assembled such that the foam bonds to these components and secures them into position.

21. The refrigerator according to claim 18 wherein the support member is a cup-shaped housing for receiving the motor.

22. The refrigerator according to claim 18 further comprising:

a conduit extending from the support member to the mounting plate through which the drive shaft extends.

23. The refrigerator according to claim 22 further comprising:

a housing mounted onto the outer wrapper defining an ice service area;

a wiring conduit extending from the support member to the housing.

24. The refrigerator according to claim 18 further wherein the ice storage bin is at least partially formed from a transparent material such that the amount of ice pieces in the ice storage bin can be readily visually determined.

25. The refrigerator according to claim 18 further wherein the ice storage bin comprises:

an upper ice bin member having a bottom edge;

a lower ice bin member connected to the lower edge of the upper ice bin member, the lower ice bin member defining an ice crushing region through which the ice pieces must pass when ice pieces are discharge through the bottom opening, the ice crushing region having an inlet opening;

the auger having a shaft portion passing through the ice crushing region;

at least one ice crusher blade rotatably connected to the shaft portion for rotation within the ice crushing region; and

at least one stationary blade mounted within the ice crushing region such that the ice crusher blade rotates past the stationary blade.

* * * * *

EXHIBIT B



US006810680B2

(12) **United States Patent**
Pohl et al.

(10) **Patent No.:** **US 6,810,680 B2**
(45) **Date of Patent:** **Nov. 2, 2004**

(54) **ICE MAKER FILL TUBE ASSEMBLY**

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(73) Assignee: **Maytag Corporation**, Newton, IA (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

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(74) *Attorney, Agent, or Firm*—Diederiks & Whitelaw,
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(57) **ABSTRACT**

An ice maker assembly in a refrigerator freezer includes a fill tube for transporting liquid to a mold. The freezer includes an outer wall spaced apart from an inner wall, with a plenum formed therebetween. An opening is formed within the inner wall, through which the fill tube extends with a clearance. Warm air generated by a defrost cycle passes through the clearance in the inner wall and around the fill tube, thereby warming the fill tube. In addition, the fill tube includes vents formed therein to allow active ventilation of the fill tube and to prevent ice formation within the fill tube.

14 Claims, 2 Drawing Sheets

(21) Appl. No.: **10/355,085**

(22) Filed: **Jan. 31, 2003**

(65) **Prior Publication Data**

US 2004/0148957 A1 Aug. 5, 2004

(51) **Int. Cl.**⁷ **F25C 5/02**

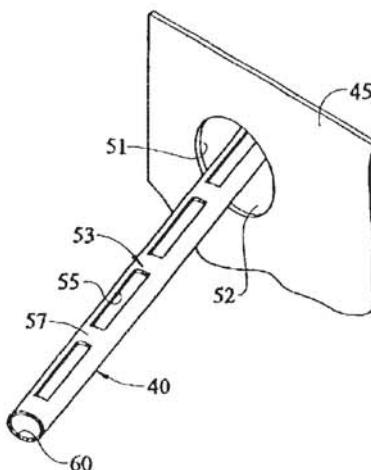
(52) **U.S. Cl.** **62/71; 62/420**

(58) **Field of Search** **62/347, 340, 300,**
62/71, 75, 353, 420

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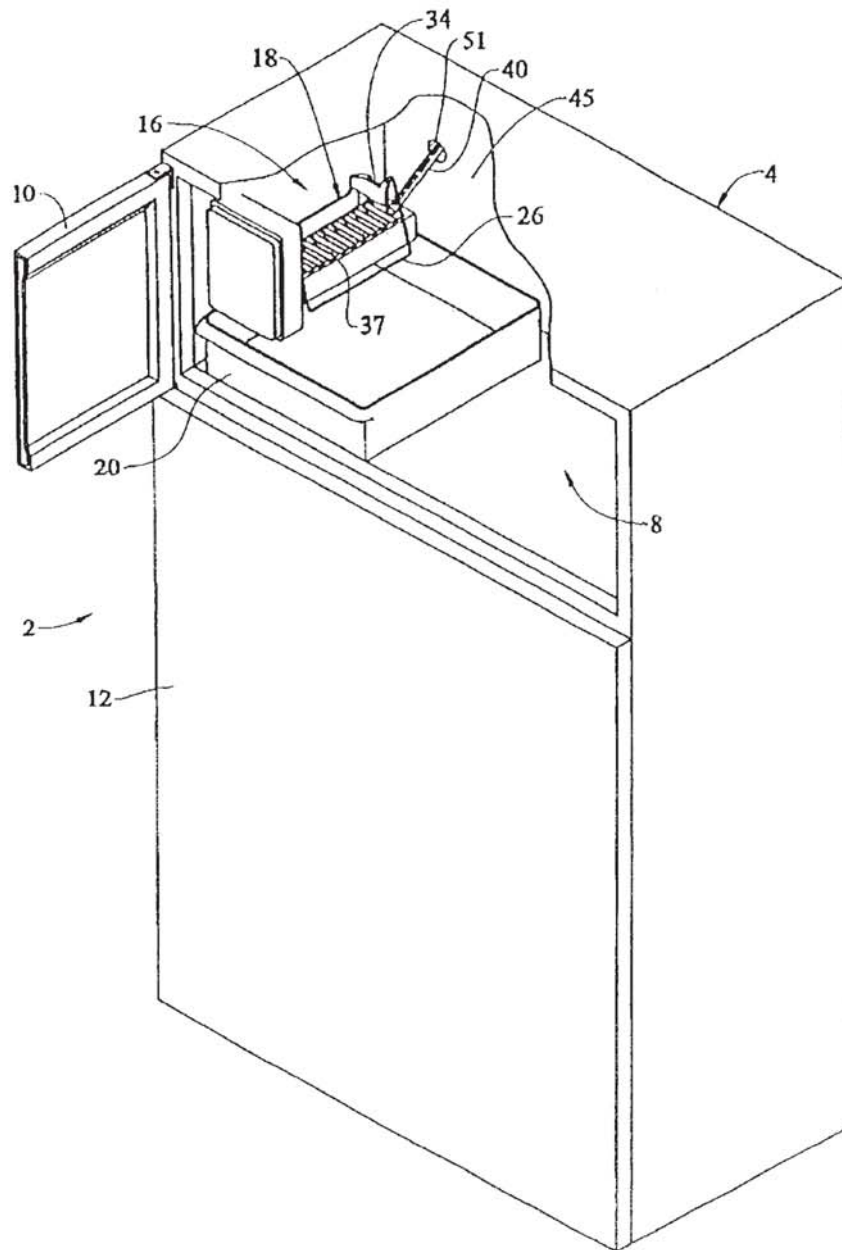
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FIG. 1



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FIG. 2

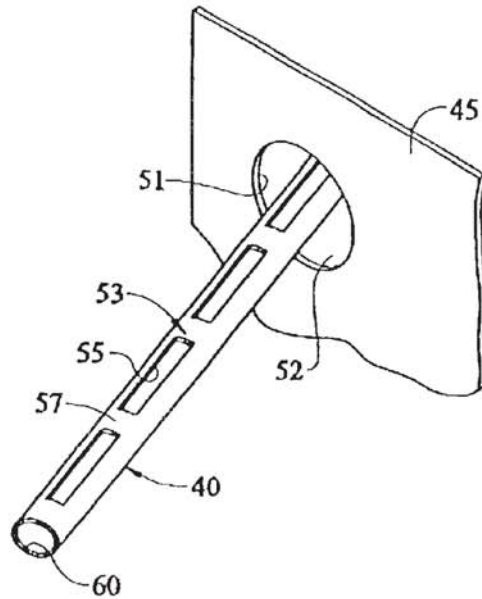
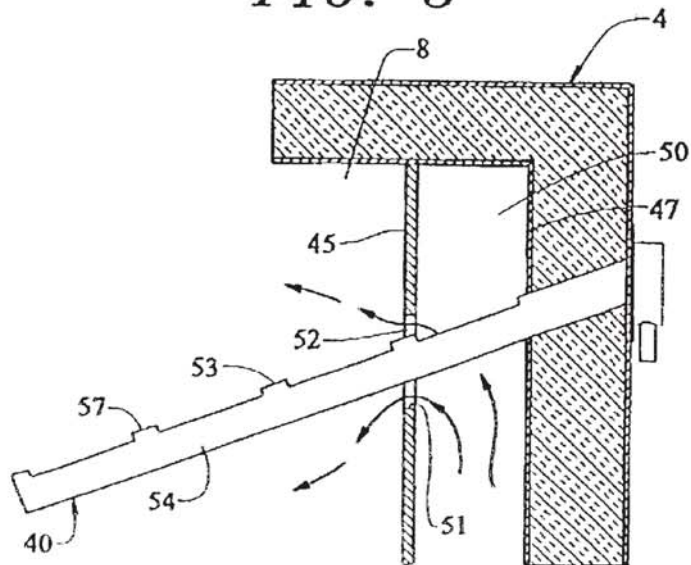


FIG. 3



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ICE MAKER FILL TUBE ASSEMBLY**BACKGROUND OF THE INVENTION****1. Field of the Invention**

The present invention pertains to the art of refrigerators, and, more particularly, to a fill tube arrangement for an ice maker assembly provided in a freezer of a refrigerator.

2. Discussion of the Prior Art

Providing automatic ice makers in household refrigerators has become extremely commonplace. Ice makers typically include a tray that is filled by a water fill tube extending through a wall of a freezer compartment.

Since the ice maker fill tube extends into the freezer compartment, a problem exists in that water can freeze within the tube and lead to clogging of the tube. Several attempts have been made to solve this problem. For example, U.S. Pat. No. 4,020,644 discloses a water supply line that is maintained in contact with the freezer compartment outer case over a pre-selected length of the fill tube sufficient to prevent freezing of water in the fill tube. In addition, the fill tube is insulated with foam material. In the arrangement of the '644, patent, there is still a possibility that the tube may freeze. More particularly, only a portion of the tube is in heat exchange relationship with the outer case. Therefore, any heat provided by the outer case may not be sufficient to prevent freezing of other portions of the fill tube. Further, the tube is surrounded by foam and may be difficult to remove if it is necessary to clear an ice blockage within the tube.

Another attempt to solve the problem of ice formation in an ice maker fill tube is demonstrated by U.S. Pat. No. 6,157,777. In this arrangement, an ice maker fill tube includes a heater for maintaining a fluid within the tube at or above a predetermined temperature. The fill tube and heater are integrally formed so the heater is protected from physical damage. However, this arrangement adds significantly to the costs associated with manufacturing the fill tube and ice maker. Additionally, the heater arrangement will certainly affect installation and repair costs associated with the fill tube and ice maker.

Based on the known prior art, there is a need in the art for an ice maker fill tube assembly that prevents ice from freezing within the fill tube. Further, there is a need for an assembly that is inexpensive to manufacture, easy to maintain, and provides reliable protection against ice build-up.

SUMMARY OF THE INVENTION

The present invention is directed to a fill tube arranged for an ice maker assembly in a freezer compartment of a refrigerator, wherein the fill tube functions to transport liquid from a reservoir to a mold. The freezer includes an outer wall spaced apart from an inner wall, and a plenum formed therebetween. An opening is formed within the inner wall, through which the fill tube extends with a desired clearance. Warm air generated by a defrost cycle passes through the clearance in the inner wall and around the fill tube, thereby warming the fill tube.

In addition, the fill tube is formed with vents to allow active ventilation of the fill tube in order to prevent ice formation within the fill tube. Particularly, warm air generated by a defrost cycle is allowed to enter the vents formed within the fill tube to prevent freezing of the fill tube. The fill tube is also exposed to dehumidified freezer air from behind

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the inner wall. The dehumidified freezer air helps to prevent ice formation on the surface of the fill tube, as well as ice restrictions within the fill tube.

Additional objects, features and advantages of the present invention will become more readily apparent from the following detailed description of a preferred embodiment when taken in conjunction with the drawings wherein like reference numerals refer to corresponding parts in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial sectional view of a refrigerator having a freezer compartment incorporating the ice maker fill tube assembly constructed in accordance with the present invention;

FIG. 2 is a perspective view of the fill tube assembly of FIG. 1; and

FIG. 3 is a cross-sectional view showing the fill tube assembly and a portion of the freezer compartment of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With initial reference to FIG. 1, a refrigerator 2 includes a cabinet 4 within which is defined a freezer compartment 8. Freezer compartment 8 can be selectively accessed through the pivoting of a freezer door 10. Also provided is a fresh food door 12 which enables access to a fresh food compartment (not shown). As shown, refrigerator 2 constitutes a top-mount model. However, as will become fully evident below, the present invention is equally applicable to various types of refrigerators, including side-by-side models.

Arranged within freezer compartment 8 is an ice maker assembly 16. In a manner known in the art, ice maker assembly 16 includes an ice maker unit 18 and an ice storage bin 20. Ice maker unit 18 is shown to include a bale arm 26 which is pivotable upward and downward based on the amount of ice retained in storage bin 20. Bale arm 26 is actually pivotally connected to a switch arm 34.

Ice maker unit 18 also includes an ice mold 37. In general, this construction, as well as the operation of ice maker unit 18, is known in the art. Basically, the flow of water is directed to ice mold 37 by a fill tube 40 to fill up various cavities (not separately labeled) of ice mold 37 in order to produce ice cubes which are deposited into storage bin 20. In a typical ice maker arrangement, when the storage bin 20 has collected a sufficient number of ice cubes, the stored ice cubes will act on bale arm 26 to cause bale arm 26 to be lifted which, in turn, operates on switch arm 34 to de-activate ice maker unit 18. Bale arm 26 is biased downward to an ice making position such that, when a sufficient number of ice cubes are removed from storage bin 20, ice maker unit 18 will be automatically reactivated. Since the operation of automatic ice makers are widely known in the art, further details thereof will not be discussed here.

The present invention is particularly directed to aspects of fill tube 40 of overall ice maker assembly 16. As previously mentioned, ice maker assembly 16 is located within freezer compartment 8. Freezer compartment 8 includes an evaporator coil cover 45, which includes air flow openings (not shown), and an insulated rear wall 47 (also see FIGS. 2 and 3) which is defined by a freezer liner. As best shown in FIG. 3, within cabinet 4, evaporator coil cover 45 and insulated rear wall 47 have a plenum 50 formed therebetween. Fill tube 40 extends through insulated rear wall 47, plenum 50,

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and evaporator coil cover 45. More specifically, evaporator coil cover 45 includes an opening 51 through which fill tube 40 passes, with a clearance 52 therebetween.

By positioning fill tube 40 so that it passes through plenum 50 and opening 51 in evaporator coil cover 45 with clearance 52, fill tube 40 is exposed to active ventilation with dehumidified freezer air. More particularly, air from plenum 50 is directed around fill tube 40 due to clearance 52 between fill tube 40 and evaporator coil cover 45. Ventilation with dehumidified freezer air sublimates ice from the surface of fill tube 40 and prevents ice restrictions within fill tube 40. In addition, fill tube 40 is exposed to heat which develops behind evaporator coil cover 45 during a freezer defrost cycle. This heat serves to melt any ice which may form within fill tube 40.

In accordance with the most preferred form of the invention, fill tube 40 includes a top or upper portion 53 and a bottom or lower portion 54. The top portion 53 of fill tube 40 includes a plurality of axially spaced vents 55 formed therein. Preferably, vents 55 take the form of elongated slots and fill tube 40 is formed of a flexible PVC material. As shown in FIG. 2, vents 55 are alternated with cross ribs 57 to help maintain the structure of fill tube 40 while allowing active venting of fill tube 40. On the other hand, bottom portion 54 of fill tube 40 is solid to allow water to flow through fill tube 40 to an outlet 60.

As indicated above, when refrigerator 2 performs a defrost cycle, warm air fills plenum 50. The warm air passes through opening 51 and surrounds fill tube 40. Warm air generated by a defrost cycle also enters vents 55 formed within fill tube 40 to prevent freezing of water within fill tube 40. Fill tube 40 is also exposed to dehumidified freezer air from behind inner wall 45 which helps to prevent ice formation on the surface of fill tube 40 and prevents ice restrictions within fill tube 40. Therefore, with this overall construction, an unobstructed supply of water to make ice cubes is available.

Although described with reference to a preferred embodiment of the invention, it should be readily understood that various changes and/or modifications can be made to the invention without departing from the spirit thereof. In general, the invention is only intended to be limited by the scope of the following claims.

We claim:

1. A refrigerator freezer comprising:

an outer wall spaced apart from an inner wall, said inner wall being formed with an opening; and

an ice maker assembly including:

a mold cavity for collecting liquid to be frozen; and
a fill tube for transporting liquid to the mold cavity, said fill tube including at least one vent formed along its length, wherein the fill tube extends through the opening in the inner wall with a clearance between said inner wall and said fill tube to permit a flow of air about the fill tube through the clearance.

2. An ice maker assembly comprising:

a mold cavity for collecting liquid to be frozen; and
a fill tube for transporting liquid to the mold cavity, said fill tube including at least one vent formed along its

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length, wherein said ice maker assembly is positioned in a refrigerator freezer having an outer wall spaced apart from an inner wall, said inner wall including an opening through which the fill tube extends, said fill tube extending through the opening with a clearance between said inner wall and said fill tube to permit a flow of the air about the fill tube through the clearance.

3. The ice maker assembly of claim 2, wherein the at least one vent includes a plurality of axially spaced vents.

4. The ice maker assembly of claim 3, wherein each of said vents takes the form of a slot.

5. The ice maker assembly of claim 4, wherein the fill tube includes an upper surface portion and a lower surface portion, said vents being formed in the upper surface portion.

6. A refrigerator freezer comprising:

an outer wall spaced apart from an inner wall, said inner wall being formed with an opening; and

an ice maker assembly including:

a mold cavity for collecting liquid to be frozen; and
a liquid fill tube for transporting liquid to the mold cavity, wherein the liquid fill tube extends through the opening in the inner wall with a clearance between said inner wall and said liquid fill tube to permit a flow of air about the fill tube through the clearance.

7. The refrigerator freezer of claim 6, wherein the liquid fill tube is formed with a plurality of longitudinally spaced vents.

8. The refrigerator freezer of claim 7, wherein each of said vents takes the form of a slot.

9. The refrigerator freezer of claim 8, wherein the fill tube includes an upper surface portion and a lower surface portion, said vents being formed in the upper surface portion.

10. The refrigerator freezer of claim 6, wherein said inner wall constitutes an evaporator coil cover.

11. The refrigerator freezer of claim 6, wherein said outer wall constitutes an insulated wall of a freezer liner.

12. A method of preventing ice from forming in an ice maker fill tube of a refrigerator comprising the steps of:

generating a flow of warm air in a plenum located between an inner wall, which is formed with an opening, and an outer wall of a refrigerator freezer compartment by running a defrost cycle in the refrigerator; and

warming the fill tube, that extends through the plenum and the opening in the inner wall, by allowing the warm air to flow around the fill tube through a clearance formed between the fill tube and the opening of the inner wall.

13. The method of claim 12, further comprising: warming the fill tube by allowing the warm air to enter at least one hole formed within the fill tube.

14. The method of claim 13, further comprising: allowing the warm air to enter any one of a plurality of axially spaced holes formed along an upper surface portion of the fill tube.

* * * * *

EXHIBIT C

(12) **United States Patent**
Pohl et al.

(10) **Patent No.:** **US 6,915,644 B2**
(45) **Date of Patent:** **Jul. 12, 2005**

(54) **ICE MAKER FILL TUBE ASSEMBLY**

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Knoxville, IL (US)

(73) Assignee: **Maytag Corporation**, Newton, IA (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/942,994**

(22) Filed: **Sep. 17, 2004**

(65) **Prior Publication Data**

US 2005/0028548 A1 Feb. 10, 2005

Related U.S. Application Data

(63) Continuation of application No. 10/355,085, filed on Jan. 31,
2003, now Pat. No. 6,810,680.

(51) **Int. Cl.**⁷ **F25C 5/02**

(52) **U.S. Cl.** **62/71; 62/420**

(58) **Field of Search** 62/71, 74, 75,
62/137, 344, 347, 352, 353, 420; 141/82;
137/588, 592

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Primary Examiner—William E Tapolcai

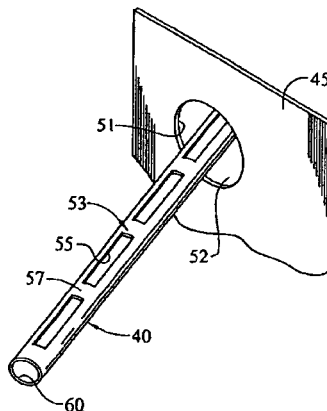
Assistant Examiner—Mohammad M. Ali

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(57) **ABSTRACT**

An ice maker assembly in a refrigerator freezer includes a fill tube for transporting liquid to a mold. The freezer includes an outer wall spaced apart from an inner wall, with a plenum formed therebetween. An opening is formed within the inner wall, through which the fill tube extends with a clearance. Warm air generated by a defrost cycle passes through the clearance in the inner wall and around the fill tube, thereby warming the fill tube. In addition, the fill tube includes vents formed therein to allow active ventilation of the fill tube and to prevent ice formation within the fill tube.

13 Claims, 2 Drawing Sheets



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Jul. 12, 2005

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FIG. 1

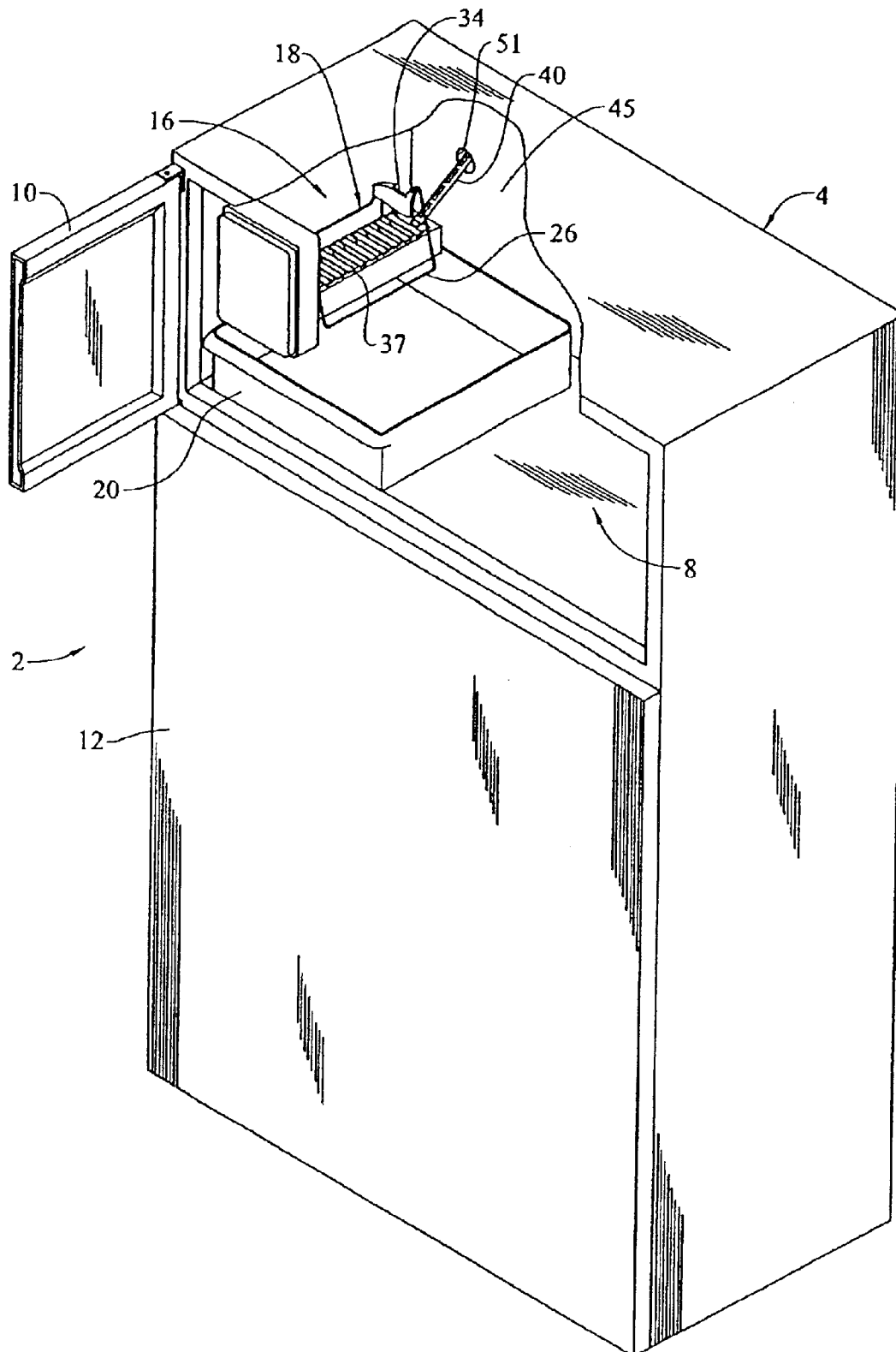


FIG. 2

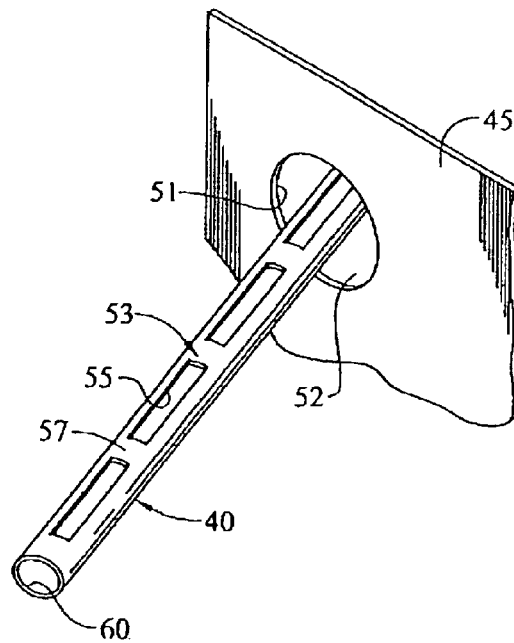
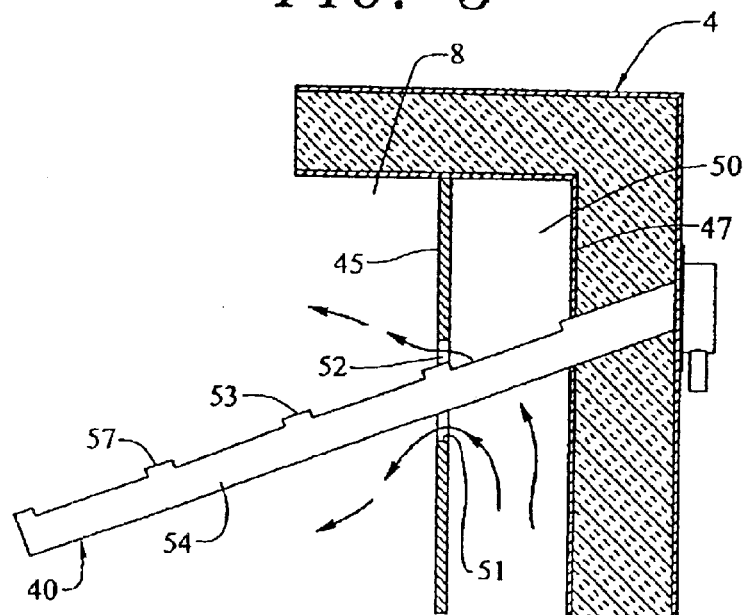


FIG. 3



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ICE MAKER FILL TUBE ASSEMBLY**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application represents a continuation of U.S. patent application Ser. No. 10/355,085 filed Jan. 31, 2003, now U.S. Pat No. 6,810,680.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

The present invention pertains to the art of refrigerators, and, more particularly, to a fill tube arrangement for an ice maker assembly provided in a freezer of a refrigerator.

2. Discussion of the Prior Art

Providing automatic ice makers in household refrigerators has become extremely commonplace. Ice makers typically include a tray that is filled by a water fill tube extending through a wall of a freezer compartment.

Since the ice maker fill tube extends into the freezer compartment, a problem exists in that water can freeze within the tube and lead to clogging of the tube. Several attempts have been made to solve this problem. For example, U.S. Pat. No. 4,020,644 discloses a water supply line that is maintained in contact with the freezer compartment outer case over a pre-selected length of the fill tube sufficient to prevent freezing of water in the fill tube. In addition, the fill tube is insulated with foam material. In the arrangement of the '644 patent, there is still a possibility that the tube may freeze. More particularly, only a portion of the tube is in heat exchange relationship with the outer case. Therefore, any heat provided by the outer case may not be sufficient to prevent freezing of other portions of the fill tube. Further, the tube is surrounded by foam and may be difficult to remove if it is necessary to clear an ice blockage within the tube.

Another attempt to solve the problem of ice formation in an ice maker fill tube is demonstrated by U.S. Pat. No. 6,157,777. In this arrangement, an ice maker fill tube includes a heater for maintaining a fluid within the tube at or above a predetermined temperature. The fill tube and heater are integrally formed so the heater is protected from physical damage. However, this arrangement adds significantly to the costs associated with manufacturing the fill tube and ice maker. Additionally, the heater arrangement will certainly affect installation and repair costs associated with the fill tube and ice maker.

Based on the known prior art, there is a need in the art for an ice maker fill tube assembly that prevents ice from freezing within the fill tube. Further, there is a need for an assembly that is inexpensive to manufacture, easy to maintain, and provides reliable protection against ice build-up.

SUMMARY OF THE INVENTION

The present invention is directed to a fill tube arranged for an ice maker assembly in a freezer compartment of a refrigerator, wherein the fill tube functions to transport liquid from a reservoir to a mold. The freezer includes an outer wall spaced apart from an inner wall, and a plenum formed therebetween. An opening is formed within the inner wall, through which the fill tube extends with a desired clearance. Warm air generated by a defrost cycle passes through the clearance in the inner wall and around the fill tube, thereby warming the fill tube.

In addition, the fill tube is formed with vents to allow active ventilation of the fill tube in order to prevent ice

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formation within the fill tube. Particularly, warm air generated by a defrost cycle is allowed to enter the vents formed within the fill tube to prevent freezing of the fill tube. The fill tube is also exposed to dehumidified freezer air from behind the inner wall. The dehumidified freezer air helps to prevent ice formation on the surface of the fill tube, as well as ice restrictions within the fill tube.

Additional objects, features and advantages of the present invention will become more readily apparent from the following detailed description of a preferred embodiment when taken in conjunction with the drawings wherein like reference numerals refer to corresponding parts in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial sectional view of a refrigerator having a freezer compartment incorporating the ice maker fill tube assembly constructed in accordance with the present invention;

FIG. 2 is a perspective view of the fill tube assembly of FIG. 1; and

FIG. 3 is a cross-sectional view showing the fill tube assembly and a portion of the freezer compartment of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With initial reference to FIG. 1, a refrigerator 2 includes a cabinet 4 within which is defined a freezer compartment 8. Freezer compartment 8 can be selectively accessed through the pivoting of a freezer door 10. Also provided is a fresh food door 12 which enables access to a fresh food compartment (not shown). As shown, refrigerator 2 constitutes a top-mount model. However, as will become fully evident below, the present invention is equally applicable to various types of refrigerators, including side-by-side models.

Arranged within freezer compartment 8 is an ice maker assembly 16. In a manner known in the art, ice maker assembly 16 includes an ice maker unit 18 and an ice storage bin 20. Ice maker unit 18 is shown to include a bale arm 26 which is pivotable upward and downward based on the amount of ice retained in storage bin 20. Bale arm 26 is actually pivotally connected to a switch arm 34.

Ice maker unit 18 also includes an ice mold 37. In general, this construction, as well as the operation of ice maker unit 18, is known in the art. Basically, the flow of water is directed to ice mold 37 by a fill tube 40 to fill up various cavities (not separately labeled) of ice mold 37 in order to produce ice cubes which are deposited into storage bin 20. In a typical ice maker arrangement, when the storage bin 20 has collected a sufficient number of ice cubes, the stored ice cubes will act on bale arm 26 to cause bale arm 26 to be lifted which, in turn, operates on switch arm 34 to de-activate ice maker unit 18. Bale arm 26 is biased downward to an ice making position such that, when a sufficient number of ice cubes are removed from storage bin 20, ice maker unit 18 will be automatically reactivated. Since the operation of automatic ice makers are widely known in the art, further details thereof will not be discussed here.

The present invention is particularly directed to aspects of fill tube 40 of overall ice maker assembly 16. As previously mentioned, ice maker assembly 16 is located within freezer compartment 8. Freezer compartment 8 includes an evaporator coil cover 45, which includes air flow openings (not shown), and an insulated rear wall 47 (also see FIGS. 2 and

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3) which is defined by a freezer liner. As best shown in FIG. 3, within cabinet 4, evaporator coil cover 45 and insulated rear wall 47 have a plenum 50 formed therebetween. Fill tube 40 extends through insulated rear wall 47, plenum 50, and evaporator coil cover 45. More specifically, evaporator coil cover 45 includes an opening 51 through which fill tube 40 passes, with a clearance 52 therebetween.

By positioning fill tube 40 so that it passes through plenum 50 and opening 51 in evaporator coil cover 45 with clearance 52, fill tube 40 is exposed to active ventilation with dehumidified freezer air. More particularly, air from plenum 50 is directed around fill tube 40 due to clearance 52 between fill tube 40 and evaporator coil cover 45. Ventilation with dehumidified freezer air sublimates ice from the surface of fill tube 40 and prevents ice restrictions within fill tube 40. In addition, fill tube 40 is exposed to heat which develops behind evaporator coil cover 45 during a freezer defrost cycle. This heat serves to melt any ice which may form within fill tube 40.

In accordance with the most preferred form of the invention, fill tube 40 includes a top or upper portion 53 and a bottom or lower portion 54. The top portion 53 of fill tube 40 includes a plurality of axially spaced vents 55 formed therein. Preferably, vents 55 take the form of elongated slots and fill tube 40 is formed of a flexible PVC material. As shown in FIG. 2, vents 55 are alternated with cross ribs 57 to help maintain the structure of fill tube 40 while allowing active venting of fill tube 40. On the other hand, bottom portion 54 of fill tube 40 is solid to allow water to flow through fill tube 40 to an outlet 60.

As indicated above, when refrigerator 2 performs a defrost cycle, warm air fills plenum 50. The warm air passes through opening 51 and surrounds fill tube 40. Warm air generated by a defrost cycle also enters vents 55 formed within fill tube 40 to prevent freezing of water within fill tube 40. Fill tube 40 is also exposed to dehumidified freezer air from behind inner wall 45 which helps to prevent ice formation on the surface of fill tube 40 and prevents ice restrictions within fill tube 40. Therefore, with this overall construction, an unobstructed supply of water to make ice cubes is available.

Although described with reference to a preferred embodiment of the invention, it should be readily understood that various changes and/or modifications can be made to the invention without departing from the spirit thereof. In general, the invention is only intended to be limited by the scope of the following claims.

What is claimed is:

1. An ice maker assembly comprising:

a mold cavity for collecting liquid to be frozen; and
a fill tube for transporting liquid to the mold cavity, said fill tube including at least one vent formed along its length, wherein the at least one vent includes a plurality of axially spaced vents for a ventilating flow of air.

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2. The ice maker assembly of claim 1, wherein each of said vents takes the form of a slot.

3. The ice maker assembly of claim 2, wherein the fill tube includes an upper surface portion and a lower surface portion, said vents being formed in the upper surface portion.

4. The ice maker assembly of claim 1, further comprising: a plurality of cross ribs alternating with the plurality of vents axially along the fill tube.

5. The ice maker assembly of claim 1, wherein the fill tube has an upper portion and a bottom portion, said bottom portion being solid to allow water to flow through the fill tube, said vents being defined along the upper portion of the fill tube.

6. A refrigerator freezer comprising:

an outer wall spaced apart from an inner wall, said inner wall being formed with an opening; and

an ice maker assembly including:

a mold cavity for collecting liquid to be frozen; and
a liquid fill tube for transporting liquid to the mold cavity, wherein the liquid fill tube extends through the opening in the inner wall, said fill tube being formed with a plurality of axially spaced vents for a ventilating flow of air.

7. The refrigerator freezer of claim 6, wherein the liquid fill tube is formed with a clearance between said inner wall and said liquid fill tube.

8. The refrigerator freezer of claim 6, wherein each of said vents takes the form of a slot.

9. The refrigerator freezer of claim 8, wherein the fill tube includes an upper surface portion and a lower surface portion, said vents being formed in the upper surface portion.

10. The refrigerator freezer of claim 6, wherein said inner wall constitutes an evaporator coil cover.

11. The refrigerator freezer of claim 6, wherein said outer wall constitutes an insulated wall of a freezer liner.

12. A method of preventing ice from forming in an ice maker fill tube of a refrigerator comprising the steps of:

generating a flow of warm air in a plenum located between an inner wall, which is formed with an opening, and an outer wall of a refrigerator freezer compartment by running a defrost cycle in the refrigerator; and

warming the fill tube, that extends through the plenum and the opening in the inner wall, by allowing the warm air to enter at least one hole formed within the fill tube.

13. The method of claim 12, further comprising: allowing the warm air to enter any one of a plurality of axially spaced holes formed along an upper surface portion of the fill tube.

* * * * *

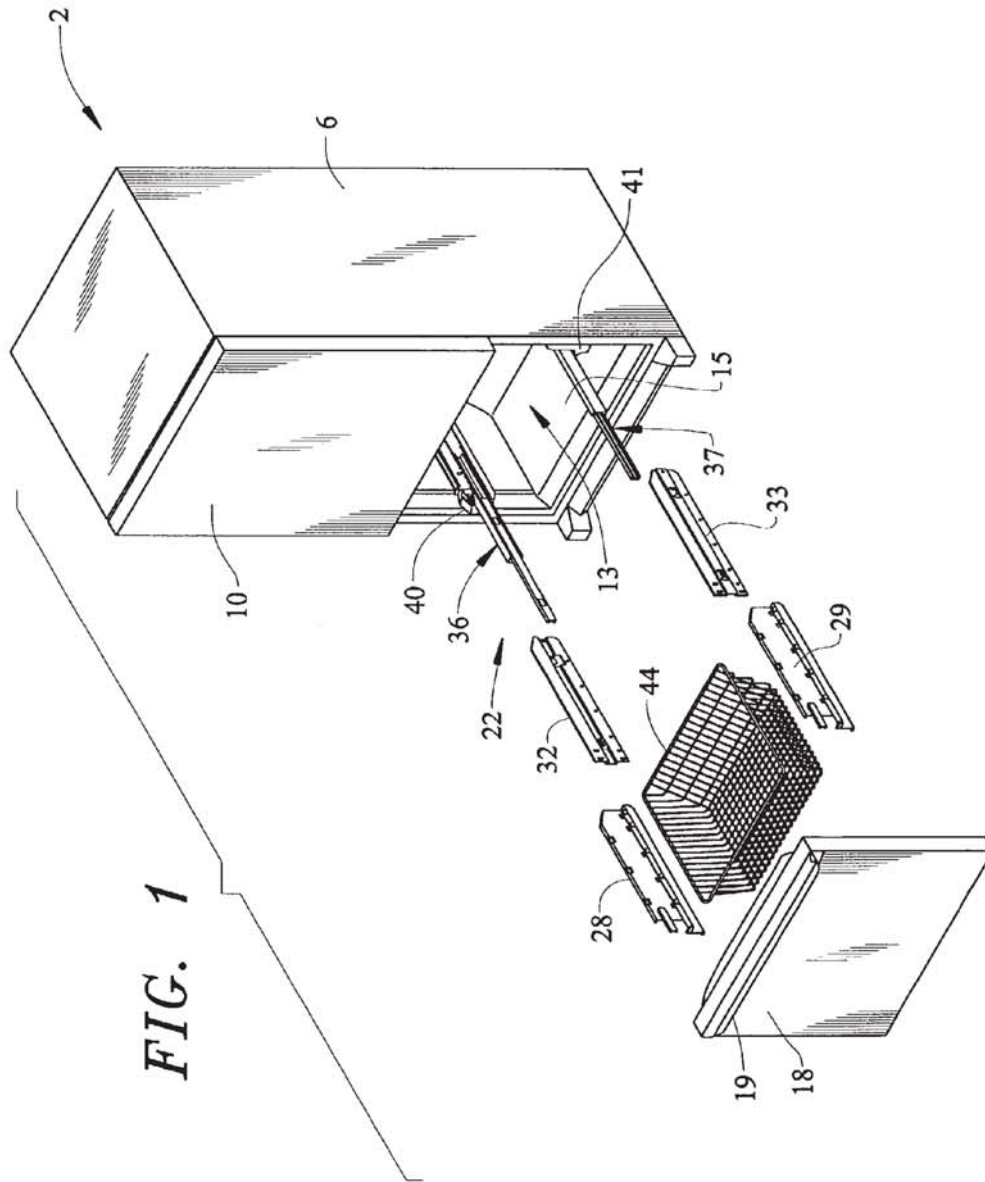
EXHIBIT D

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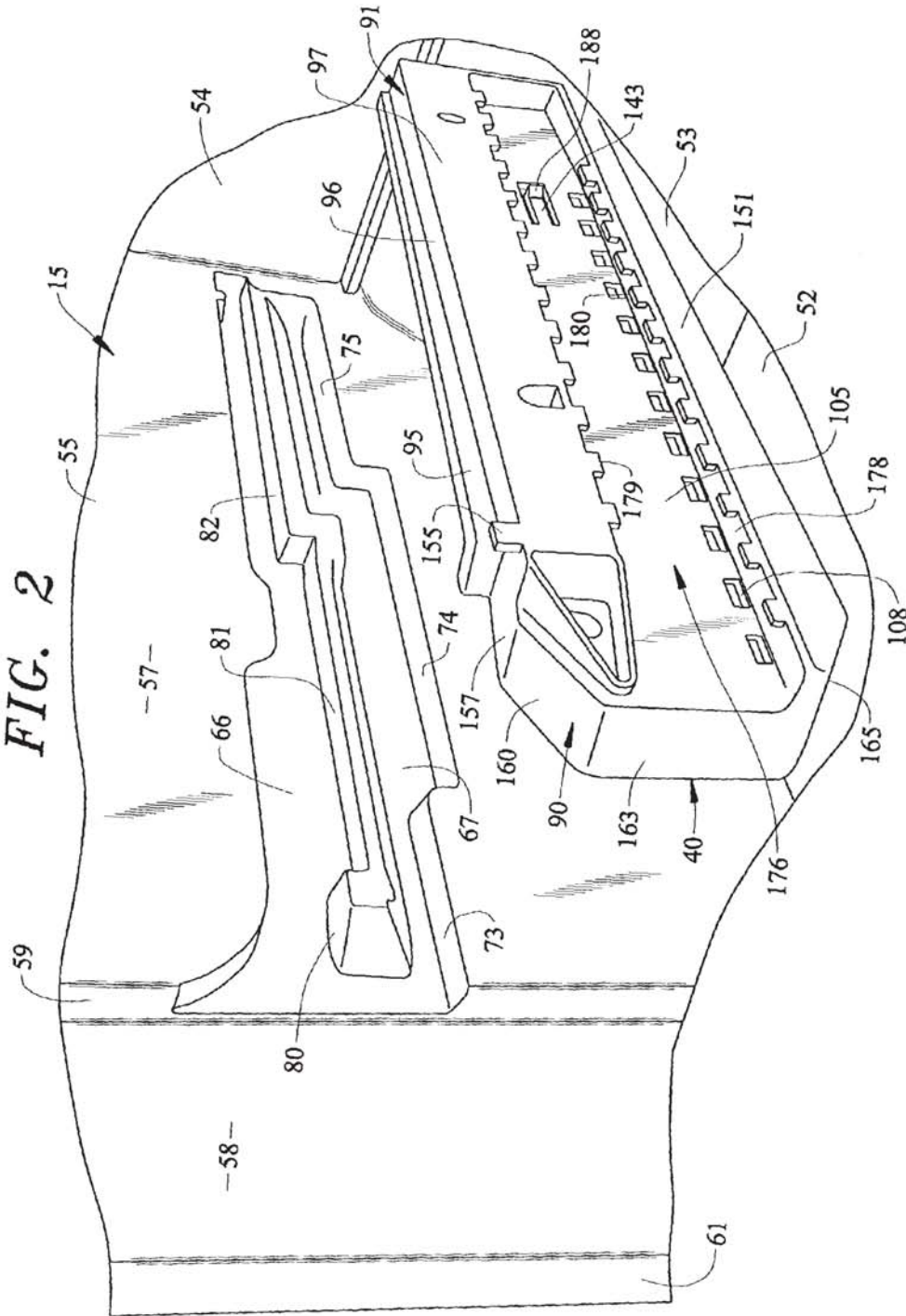
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FIG. 2



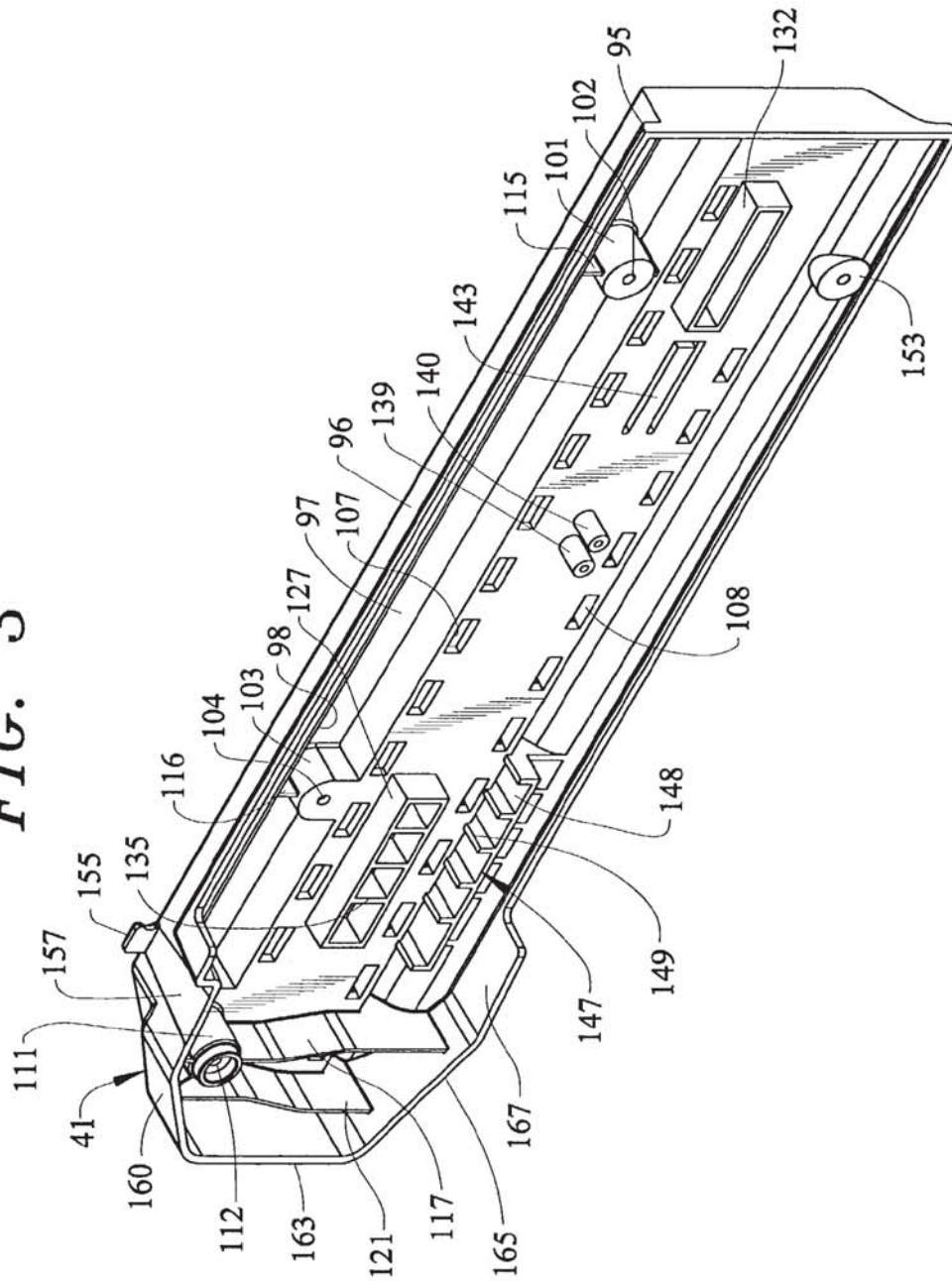
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FIG. 3



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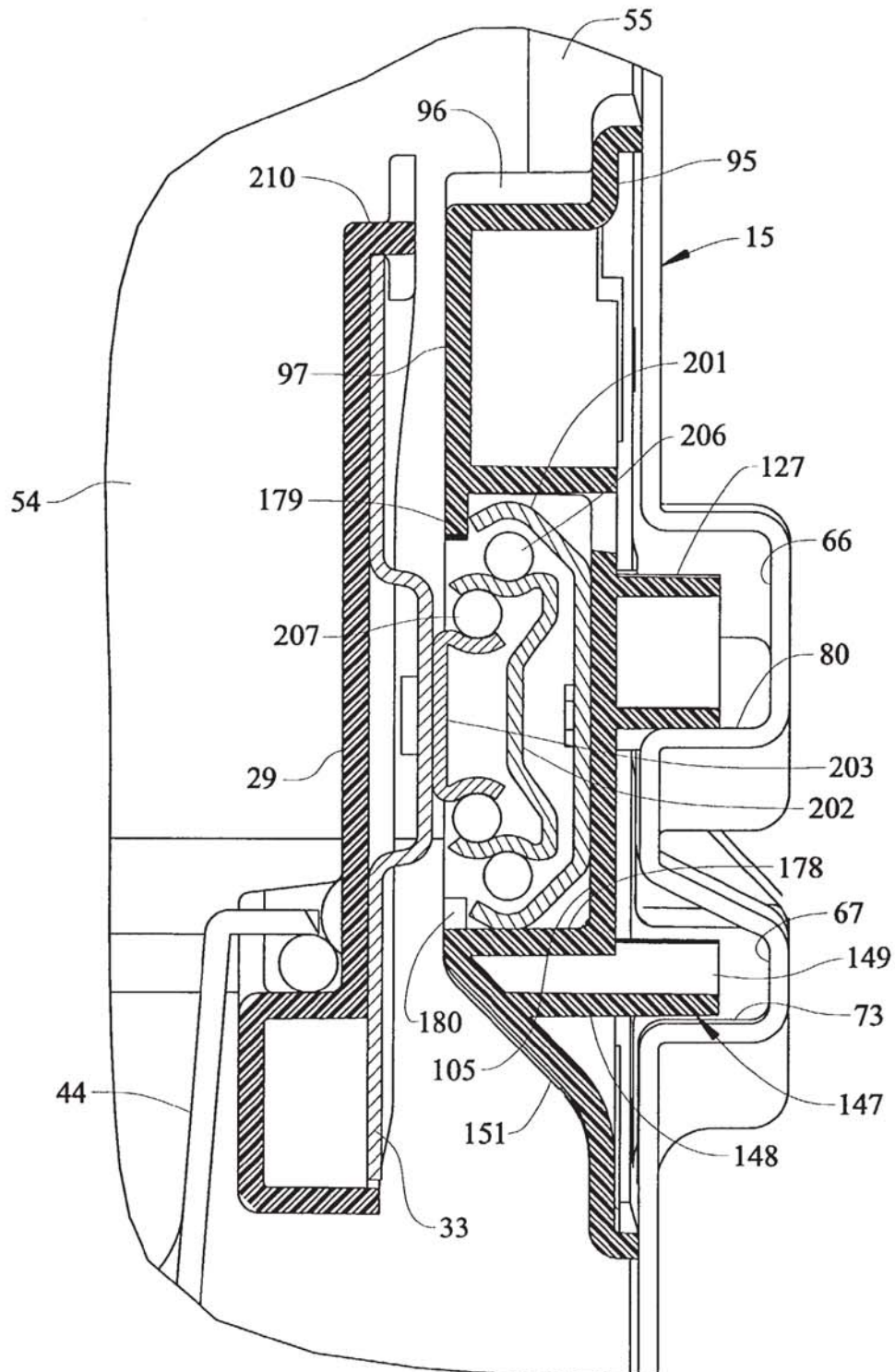
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FIG. 5



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FREEZER DRAWER SUPPORT ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit to U.S. Provisional Application No. 60/364,108 filed on Mar. 15, 2002.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to the art of refrigerators and, more particularly, to a support arrangement for a pull-out freezer drawer.

2. Discussion of the Prior Art

There exist various styles of refrigerators on the market. Most common are side-by-side, top mount, and bottom mount models. In a side-by-side model, fresh food and freezer compartments are arranged laterally adjacent one another. A top mount refrigerator includes an upper freezer compartment and a lower fresh food compartment. Finally, bottom mount models have the fresh food compartment located above the freezer compartment.

In bottom mount models, it is known to employ both pivoting freezer doors and freezer doors which slide between open and closed positions. In a bottom mount style refrigerator including either a pivoting or sliding door, it is known to employ one or more sliding baskets to store food items within the freezer compartment. More specifically, in connection with a bottom mount refrigerator including a pivoting freezer door, it is known to thermoform a freezer compartment defining liner with integral side rails upon which one or more baskets can be directly slidably supported. In bottom mount refrigerators employing sliding doors, it is common to mount elongated support members to the opposing side walls of the freezer compartment through the use of mechanical fasteners, and then to support one or more baskets, either directly or indirectly, upon the support members. Typically, in this case, at least the support for one of the baskets is also connected to the door such that, as the door is slid relative to a cabinet of the refrigerator, the basket shifts into and out of the freezer compartment. Most commonly, these types of bottom mount refrigerators employ metal liners into which mechanical fasteners in the form of screws are secured to attach the support members.

Given construction and assembly variations between these different types of bottom mount refrigerators, completely different liners are required depending on whether a pivoting or sliding door arrangement is desired. Therefore, it is not possible to simply change a bottom mount refrigerator designed for use with a pivoting door to employ a sliding door arrangement. Based thereon, it would be beneficial to provide a supplemental adapter assembly which would enable a bottom mount refrigerator cabinet to be used with either pivoting or sliding doors and their associated basket arrangements.

SUMMARY OF THE INVENTION

The present invention is directed to a support assembly which is adapted to be fitted between rail structure formed in a thermoformed or injection molded freezer compartment liner of a bottom mount refrigerator in order to enable the refrigerator to be used with a slidably mounted freezer door/storage drawer combination. More specifically, a freezer compartment liner, formed with integral side rail structure that can directly, slidably support storage drawers

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or baskets, is adapted to receive side support adapters that enable the liner to be used in combination with a slidably freezer door which is interconnected to extensible slide structure for one or more drawers or baskets.

In accordance with the most preferred embodiment of the invention, each side support adapter includes upper and lower basket support structure. The lower basket support structure defines a channel which is adapted to snap-fittingly receive a drawer support slide member that is indirectly attached to a slidably freezer door of the refrigerator. The upper basket support structure is defined by a ledge on each of the side adapters which provides a support surface for an upper basket to slide independently of the lower basket. Projecting from a rear of each side support adapter are multiple lugs which are received within grooves or recesses defined in the liner and rest on substantially horizontal ledge portions through which vertical loads are transferred to the overall cabinet of the refrigerator. Each side adapter is preferably tapered from front to back to offset a tapering of the thermoformed or injection molded liner. In this manner, the opposing side adapters extend substantially parallel to each other. Mechanical fasteners are used to secure the side support adapters in place.

Additional objects, features and advantages of the present invention will become more readily apparent from the following detailed description of a preferred embodiment when taken in conjunction with the drawings wherein like reference numerals refer to corresponding parts in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial exploded view of a bottom mount style refrigerator incorporating the freezer drawer support assembly of the invention;

FIG. 2 is an enlarged view of a side wall portion of a liner provided in the refrigerator of FIG. 1, with a side adapter of the freezer drawer support assembly shown adjacent thereto prior to mounting;

FIG. 3 is a rear view of the side adapter of the freezer drawer support assembly of the invention;

FIG. 4 is a partial view of the side wall portion of FIG. 2, with the side adapter of the freezer drawer support assembly of the invention secured thereto; and

FIG. 5 is a cross-sectional view of the overall drawer support assembly of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With initial reference to FIG. 1, a refrigerator incorporating the invention is generally indicated at 2. Refrigerator 2 includes a cabinet shell 6 to which is attached a fresh food compartment door 10. At this point, it should be readily recognized that refrigerator 2 constitutes a bottom mount style refrigerator wherein fresh food compartment door 10 is adapted to seal off an upper fresh food compartment defined within cabinet shell 6. In a manner known in the art, fresh food compartment door 10 is preferably, pivotally mounted about a vertical axis to cabinet shell 6 through upper and lower hinges (not shown). Refrigerator 2 also includes a lower freezer compartment 13 which is defined by a liner 15. Freezer compartment 13 is adapted to be sealed by means of a freezer door 18 having an associated handle 19. In accordance with the present invention, freezer door 18 is adapted to slide towards and away from cabinet shell 6 through the

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use of a slide assembly generally indicated at 22 in order to selective access or seal freezer compartment 13.

As shown in this figure, slide assembly 22 generally includes a pair of opposing basket support plates 28 and 29 which are adapted to be fixedly secured to a rear portion of freezer door 18 through suitable brackets and fasteners (not shown). Basket support plates 28 and 29 respectively mate with a pair of door support plates 32 and 33 which, in turn, interconnect basket support plates 28 and 29 to respective extensible drawer slides 36 and 37. As will be detailed more fully below, drawer slides 36 and 37 are interconnected to liner 15 of freezer compartment 13 through respective side adapters 40 and 41. The present invention is particularly concerned with the inclusion, construction, and mounting of each side adapter 40, 41 as will be detailed below. FIG. 1 also illustrates a lower basket 44 which is adapted to be carried by basket support plates 28 and 29 so as to be shiftable into and out of freezer compartment 13 with the movement of freezer door 18.

FIG. 2 illustrates details of liner 15 and side adapter 40. In general, liner 15 includes a flat bottom portion 52, an inclined bottom portion 53, a rear wall 54, and opposing side walls 55. Each side wall 55 is shown to include an aft section 57 and a frontal section 58. In the preferred embodiment shown, aft and frontal sections 57 and 58 extend in different planes and are interconnected by an offset section 59. In any event, frontal section 58 leads to a frontal edge generally indicated at 61.

Formed in side wall 55, from offset section 59 to directly adjacent rear wall 54, is an elongated upper groove or recess 66, as well as a lower groove or recess 67. In general, upper and lower grooves 66 and 67 are formed in each side wall 55 in order to enable upper and lower baskets (not shown) to be slideably mounted within liner 15 when refrigerator 2 is utilized in combination with a pivoting freezer door. In accordance with the present invention, side adapters 40 and 41 are provided to mate with the structure of upper and lower grooves 66 and 67 in order to enable liner 15 to be utilized in connection with slideable freezer door 18 and slide assembly 22.

Based on the above, it should be recognized that, although the actual configuration of upper and lower grooves 66 and 67 can take various forms, the preferred form shown in FIG. 2 is known in the art for use in connection with a bottom mount refrigerator employing a pivotable freezer door and upper and lower freezer baskets. In any event, the actual configuration shown for upper and lower grooves 66 and 67 are perhaps best defined by the supporting structure associated therewith. Therefore, due to the inclusion of lower groove 67, side wall 55 is formed with a lower frontal ledge portion 73, an intermediate, lower ledge portion 74, and a lower, rear ledge portion 75. In addition, due to the presence of upper groove 66, side wall 55 defines an upper frontal ledge portion 80, an upper intermediate ledge portion 81, and an upper, rear ledge portion 82. Again, this structure enables an upper rim of a lower basket, and a lower rim of an upper basket to extend between the side walls 55 of liner 15 and be slideably mounted for movement into and out of freezer compartment 13. However, in accordance with the present invention, side adapters 40 and 41 are mounted utilizing the existing structure of side walls 55 to accommodate the overall slide assembly 22 in accordance with the invention.

Reference will now be made to FIGS. 2-4 in describing the construction of each side adapter 40, 41 of the present invention. At this initial stage, it should be noted that side adapters 40 and 41 are essentially mirror images of one

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another, such that the common structure will be described with respect to side adapter 40 shown in FIGS. 2 and 4 and side adapter 41 as shown in FIG. 3. In general, each side adapter 40, 41 includes a frontal section 90 and a rear section 91. As it is important to enable freezer door 18 to shift straight away from cabinet shell 6 and return to a position which establishes a proper seal, each side adapter 40, 41 is specifically constructed to accommodate for any divergence between side walls 55 of liner 15 in order that side adapters 40 and 41 define parallel paths for extensible drawer slides 36 and 37. Therefore, in accordance with the most preferred form of the invention, each side adapter 40, 41 slightly tapers from frontal section 90 to rear section 91 as indicated in these figures.

In any event, each side adapter 40, 41 is shown to include an upstanding wall 95 which follows the contour of side wall 55 from offset section 59 through aft section 57, with upstanding wall 95 leading to an upper ledge 96. In turn, upper ledge 96 leads to an upper wall 97 behind which is defined an elongated recess indicated at 98 in FIG. 3. Preferably defined within recess 98 is a first boss 101 provided with a hole 102, as well as a second boss 103 provided with a corresponding hole 104. Below upper wall 97 is provided a recessed, intermediate wall 105 that is shown to include an upper row of slots 107 and a lower row of slots 108. Located forward of recess 98 is a third boss 111 having an associated hole 112. As will be detailed more fully below, first, second and third bosses 101, 103 and 111 are adapted to receive mechanical fasteners through respective holes 102, 104 and 112 in mounting side adapters 40 and 41 to liner 15. For reinforcement purposes, a plurality of ribs, such as those indicated at 115-117 are provided as structural reinforcements around bosses 101, 103 and 111 respectively. An additional structural reinforcement 121 is preferably provided forward of third boss 111 as well.

In the most preferred form of the invention, each side adapter 40, 41 is injection molded of plastic. Most preferably, when forming each side adapter 40, 41, intermediate wall 105 is integrally formed with an upper frontal lug 127 and a rear lug 132. In the most preferred form of the invention, each of upper frontal lug 127 and rear 132 is generally boxed-shaped, with at least upper frontal lug 127 being provided with various cross supports 135. Also formed along intermediate wall 105 is a pair of central bosses 139 and 140, as well as a cantilevered member 143.

Below intermediate wall 105, and preferably beneath upper frontal lug 127, is a lower frontal lug 147. In accordance with the embodiment shown, lower frontal lug 147 includes a main plate portion 148 from which extend a plurality of ribs 149. Also arranged below intermediate wall 105 is a lower wall 151 which is shown to be formed with a fourth boss 153.

As shown in FIGS. 2-4, upper ledge 96 has projecting therefrom an upstanding stop 155. Upstanding stop 155 is spaced from upstanding wall 95 by upper ledge 96. Adjacent upstanding stop 155, upper ledge 96 leads to a lateral section 157 of a respective side adapter 40, 41. Lateral section 157 forms part of frontal section 90 and leads to a forwardly sloping section 160, a front face section 163, a rearwardly sloping section 165, and a short bottom section 167. With this overall construction, each side adapter 40, 41 defines a channel 176 that extends along intermediate wall 105 and which defines a lower ledge 178. Channel 176 is also defined, at least laterally, by an upper row of teeth members 179 and a lower row of teeth members 180. As clearly shown in these figures, cantilevered member 143 is exposed to

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channel 176 and is provided at a rear end thereof with a wedge section 188 which projects into channel 176.

During assembly of refrigerator 2, liner 15 is preferably thermoformed with upper and lower grooves 66 and 67. With this construction, liner 15 can be used to directly, slideably support upper and lower freezer baskets when refrigerator 2 is used in combination with a pivoting freezer door. However, in accordance with the present invention wherein freezer door 15 is slideable relative to cabinet shell 6, each side wall 55 has mounted thereon a respective side adapter 40, 41. In mounting each side adapter 40, 41, upper frontal lug 127 is positioned to rest upon upper frontal ledge portion 80, rear lug 132 is positioned upon upper rear ledge portion 82, and lower frontal lug 147 sets upon lower frontal ledge portion 73. The resting of upper frontal lug 127 and lower frontal lug 147 in this manner is seen to be clearly illustrated in FIG. 5.

Due to the construction of each side adapter 40, 41, frontal section 90 is made to conform to frontal section 58, as well as offset section 59, of a respective side wall 55. Correspondingly, rear section 91 conforms to aft section 57 of side wall 55. Once supported in this fashion, mechanical fasteners (not shown) are extended through holes 102, 104 and 112 in bosses 101, 103 and 111 in order to fixedly secure each side adapter 40, 41 to a respective side wall 55. Most preferably, refrigerator 2 is provided with mounting structure, such as in the form of plates, which are arranged behind liner 15 at the location of at least bosses 101, 103 and 111, with this mounting structure being rigidly maintained in a desired position upon the curing of foamed insulation injected between cabinet shell 6 and liner 15 in a manner known in the art. Therefore, the threaded fasteners associated with bosses 101, 103 and 111 extend not only through liner 15 but also into additional mounting structure to secure each side adapter 40, 41 in place. If desired, an additional fastening point can be established at fourth boss 153.

Once side adapters 40 and 41 are mounted in this fashion, each drawer slide 36, 37 can be secured to a respective side adapter 40, 41 within channel 176. More specifically, each drawer slide 36, 37 is slid upon a respective lower ledge 178, between intermediate wall 105 and the upper and lower rows of teeth members 179 and 180. As best shown in FIG. 5, each drawer slide 36, 37 preferably includes an outermost cabinet member 201, an intermediate member 202 and a drawer member 203. Interposed between cabinet member 201 and intermediate member 202 are respective ball bearings 206. Similarly, ball bearings 207 are provided between intermediate member 202 and drawer member 203.

In any event, each drawer slide 36, 37 is adapted to be mounted within a respective channel 176. As cabinet member 201 reaches cantilevered member 143, the abutment with wedge section 188 will cause cantilever member 143 to deflect inward, thereby allowing at least a portion of cabinet member 201 to pass cantilever member 143. Although not shown in these figures, cabinet member 201 preferably includes an aperture which becomes aligned with wedge section 188 upon full insertion of slide assembly 22 within channel 176 such that cantilevered member 143 will be caused to again deflect to the position shown in FIGS. 2 and 4, thereby selectively retaining drawer slide 36, 37 in position. Actually, there is preferably a rather snug fit between drawer member 201 and channel 176 as generally represented in FIG. 5.

As also shown in this figure, drawer member 203 is fixedly secured to a respective door support plate 32, 33 which, in turn, is interconnected to a respective basket support plate 28, 29. Since each basket support plate 28, 29

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is secured to freezer door 18, when freezer door 18 is pulled away from cabinet shell 6, basket support plates 28 and 29 and door support plates 32 and 33 will be drawn out of freezer compartment 13 with drawer member 203. Drawer member 203 will be shifted relative to intermediate member 202 due to the arrangement of ball bearings 207. When drawer member 203 reaches a fully extended position, then both drawer member 203 and intermediate member 202 will extend relative to cabinet shell 6 and cabinet member 201. Eventually, extensible drawer slides 36 and 37 will achieve their maximum extended position, at which point at least basket 44 is fully exposed outside of freezer compartment 13.

Based on the above description, it should be readily apparent that the inclusion of side adapters 40 and 41 not only enable the use of a common liner 15 on various model refrigerators, but accommodates the tapering of side walls 55 to assure that extensible drawer slides 36 and 37 will extend parallel to one another. The incorporation, structure and positioning of lugs 127, 132 and 147 enable each side adapter 40, 41 to nest in the existing geometry formed into liner 15 either through a thermoforming or injection molding process. Therefore, lugs 127, 132 and 147 transfer vertical loads directly to the overall foamed refrigerator assembly which is considered to be extremely advantageous, as opposed to hanging side adapters 40, 41 from liner 15 solely through the use of screws and anchors. The inclusion of cantilevered member 143 and wedge section 188 advantageously provides a snap feature for the mounting of a respective drawer slide 36, 37 and prevents the drawer slide 36, 37 from undesirably sliding forward. Upper ledge 96 on each side adapter 40, 41 establishes a setting surface for an upper basket (not shown) which can slide independently of drawer slides 36 and 37. This configuration is considered to allow a greater range of motion for an upper basket. When such an upper basket is employed, it should be noted that the basket can be drawn out to also rest upon an uppermost edge 210 of basket support plates 28 and 29.

Although described with reference to a preferred embodiment of the invention, it should be readily understood that various changes and/or modifications can be made to the invention without departing from the spirit thereof. For instance, it should be readily apparent that side adapters 40 and 41 have been configured based on the preferred construction shown for side walls 55 of liner 15. This configuration is currently used in connection with a freezer compartment 13 of approximately 33 inches wide. On more narrow models wherein only a single basket may be utilized, only a single groove may be provided in the liner. Therefore, the actual configuration of the side adapters and the number of lugs for supporting the same would correspondingly change. Of course, it is also known to produce refrigerator liners with inwardly projecting rails and a side adapter in accordance with the present invention could also be configured for use with this type of arrangement. Regardless, given that the invention is intended for use in connection with a slideable freezer door 18, it is important to maintain the parallel relationship between the respective channels 176 and therefore side adapters 40 and 41 must be constructed in such a manner as to compensate for variations in the lateral dimensions of the freezer liner, such as in cases where the freezer liner tapers from front to rear. In any event, side adapters 40 and 41 can advantageously define support structure for multiple baskets and are integrally formed with lug structure which effectively transfers vertical loading. In general, the invention is only intended to be limited by the scope of the following claims.

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I claim:

1. A refrigerator comprising:

an upper fresh food compartment having an associated fresh food compartment door;

a lower freezer compartment having an associated freezer door, said freezer compartment being defined by a liner having opposing side walls which taper fore-to-aft such that a distance between the opposing side walls at a front portion of the freezer compartment is greater than a distance between the opposing side walls at a rear portion of the freezer compartment, each of the opposing side walls including at least one fore-to-aft extending groove defining a ledge portion;

a freezer drawer support assembly including first and second side adapters, each having an upper ledge, a channel and a plurality of lugs, and a pair of extensible drawer slides, each of said first and second side adapters tapering from a rear portion to a front portion, said first and second side adapters being mounted to the first and second opposing side walls respectively, with the plurality of lugs projecting into the at least one groove and with the upper ledges and channels of the first and second side adapters being arranged substantially parallel to each other, said pair of extensible drawer slides being mounted in the channels of the first and second side adapters, said freezer door being connected to the extensible drawer slides for fore-to-aft movement in order to selectively access the freezer compartment; and

a basket slidably supported by one of the upper ledge of each side adapter and the extensible drawer slides.

2. A refrigerator comprising:

an upper fresh food compartment having an associated fresh food compartment door;

a lower freezer compartment having an associated freezer door, said freezer compartment being defined by a liner having opposing side walls which taper fore-to-aft such that a distance between the opposing side walls at a front portion of the freezer compartment is greater than a distance between the opposing side walls at a rear portion of the freezer compartment;

a freezer drawer support assembly including first and second side adapters, each having an upper ledge and a channel, and a pair of extensible drawer slides, each of said first and second side adapters tapering from a rear portion to a front portion, said first and second side adapters being mounted to the first and second opposing side walls respectively, for supporting the side adapter in the freezer compartment, with the upper ledges and channels of the first and second side adapters being arranged substantially parallel to each other, said pair of extensible drawer slides being mounted in the channels of the first and second side adapters, said freezer door being connected to the extensible drawer slides for fore-to-aft movement in order to selectively access the freezer compartment.

3. The refrigerator according to claim 2, further comprising:

a pair of basket support plates fixed to the freezer door; and

a basket slidably supported by the pair of basket support plates.

4. The refrigerator according to claim 3, further comprising first and second door support plates slidably engaged with the pair of basket support plates.

5. The refrigerator according to claim 2, wherein each of the opposing side walls of the liner includes at least one

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groove defining a ledge portion and each of said side adapters is provided with a plurality of lugs extending from a rear surface thereof, said lugs extending into the at least one groove and nesting with the ledge portions for supporting the side adapter in the freezer compartment.

6. The refrigerator according to claim 5, wherein each of the side adapters further includes a plurality of bosses which are adapted to receive mechanical fasteners for fixing each of the side adapters to the liner.

7. The refrigerator according to claim 2, wherein the upper ledges are adapted to slidably support a food storage basket.

8. The refrigerator according to claim 7, further comprising a stop projecting up from at least one of the upper ledges for limiting a permissible degree of shifting of a food storage basket slidably supported on the upper ledges.

9. The refrigerator according to claim 2, wherein each of the side adapters includes an upper wall, a lower wall and an intermediate wall, said intermediate wall being recessed relative to the upper and lower walls so as to define the channel.

10. The refrigerator according to claim 9, further comprising a plurality of spaced teeth members extending from each of the upper and lower walls, said channel being defined laterally between the intermediate wall and the plurality of spaced teeth members in each of the side adapters.

11. The refrigerator according to claim 2, further comprising a member cantilevered from one of the first and second side adapters and projecting into the channel for snap-fittingly engaging a respective one of the drawer slides.

12. The refrigerator according to claim 11, wherein each of the drawer slides includes a cabinet member, an intermediate member and a drawer member which are extensibly interconnected.

13. A refrigerator comprising:

an upper fresh food compartment having an associated fresh food compartment door;

a lower freezer compartment having an associated freezer door, said freezer compartment being defined by a liner having opposing side walls, each of the opposing side walls including at least one fore-to-aft extending groove;

a freezer drawer support assembly including first and second side adapters, each having an upper ledge, a channel and a plurality of lugs, and a pair of extensible drawer slides, said first and second side adapters being mounted to the first and second opposing side walls respectively, with the plurality of lugs projecting into the at least one groove and with the upper ledges and channels of the first and second side adapters being arranged substantially parallel to each other, said pair of extensible drawer slides being mounted in the channels of the first and second side adapters, said freezer door being connected to the extensible drawer slides for fore-to-aft movement in order to selectively access the freezer compartment; and

a basket slidably supported by one of the upper ledge of each side adapter and the extensible drawer slides.

14. The refrigerator according to claim 13, further comprising: a pair of basket support plates fixed to the freezer door, wherein the basket is slidably supported by the pair of basket support plates.

15. The refrigerator according to claim 14, further comprising first and second door support plates slidably engaged with the pair of basket support plates.

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16. The refrigerator according to claim 13, wherein each side adapter further includes a plurality of bosses which are adapted to receive mechanical fasteners for fixing each of the side adapters to the liner.

17. The refrigerator according to claim 13, further comprising a stop projecting up from at least one of the upper ledges for limiting a permissible degree of shifting of a food storage basket slidably supported on the upper ledges.

18. The refrigerator according to claim 13, wherein each of the side adapters includes an upper wall, a lower wall and an intermediate wall, said intermediate wall being recessed relative to the upper and lower walls so as to define the channel.

19. The refrigerator according to claim 18, further comprising a plurality of spaced teeth members extending from each of the upper and lower walls, said channel being defined laterally between the intermediate wall and the plurality of spaced teeth members in each of the side adapters.

20. The refrigerator according to claim 19, further comprising a member cantilevered from one of the first and second side adapters and projecting into the channel for snap-fittingly engaging a respective one of the drawer slides.

21. The refrigerator according to claim 20, wherein each of the drawer slides includes a cabinet member, an intermediate member and a drawer member which are extensibly interconnected.

22. For a refrigerator including an upper fresh food compartment having an associated fresh food compartment door and a lower freezer compartment having an associated freezer door, with said freezer compartment being defined by a liner having opposing side walls provided with fore-to-aft extending grooves that define opposing ledge portions which can directly support a slidable basket, a method of mounting a freezer drawer support assembly comprising:

positioning elements projecting from rear portions of first and second side adapters into the fore-to-aft extending grooves and on the ledge portions of the first and second opposing side walls in order to mount the first and second side adapters within the freezer compartment; and

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connecting a pair of extensible drawer slides to the first and second side adapters respectively, with the freezer door being connected to the pair of extensible drawer slides for sliding movement relative to the liner.

23. The method of claim 22, further comprising: snap-fitting the pair of extensible drawer slides in channels defined by the first and second side adapters.

24. The method of claim 22, further comprising: positioning the pair of extensible drawer slides vertically between upper and lower walls, and laterally between an intermediate wall and a plurality of teeth members, formed on each of the side adapters.

25. The method of claim 22, further comprising:

attaching basket support plates to the pair of extensible drawer slides; and

slidably supporting a basket on the basket support plates.

26. The method of claim 25, further comprising: fixing the basket support plates to the freezer door such that the basket support plates and the basket shift in unison with the freezer door, while the basket is slidable relative to the freezer door.

27. The method of claim 26, further comprising: providing the first and second side adapters with ledges above the grooves, with the ledges being adapted to slidably support another basket for movement into and out of the freezer compartment.

28. The method of claim 25, further comprising: interconnecting a pair of door support plates between the basket support plates and the pair of extensible drawer slides.

29. The method of claim 22, further comprising: fixing each of the side adapters within the freezer compartment with the side adapters tapering from back to front in order to compensate for a front to rear tapering of the side walls of the freezer compartment such that the pair of extensible drawer slides are arranged substantially parallel to each other.

* * * * *

EXHIBIT E



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(12) **United States Patent**
Koons

(10) **Patent No.:** **US 7,240,980 B2**
(45) **Date of Patent:** ***Jul. 10, 2007**

(54) **FREEZER DRAWER SUPPORT ASSEMBLY**

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(73) Assignee: **Whirlpool Corporation**, Benton Harbor, MI (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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(21) Appl. No.: **11/249,375**

(22) Filed: **Oct. 14, 2005**

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US 2006/0033410 A1 Feb. 16, 2006

Related U.S. Application Data

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(60) Provisional application No. 60/364,108, filed on Mar. 15, 2002.

(51) Int. Cl. **A47B 96/04** (2006.01)

(52) U.S. Cl. **312/404; 312/402; 312/334.8**

(58) Field of Classification Search **312/401, 312/402, 404, 405, 405.1, 408, 321.5, 330.1, 312/334.8, 333; 62/382, 440**

See application file for complete search history.

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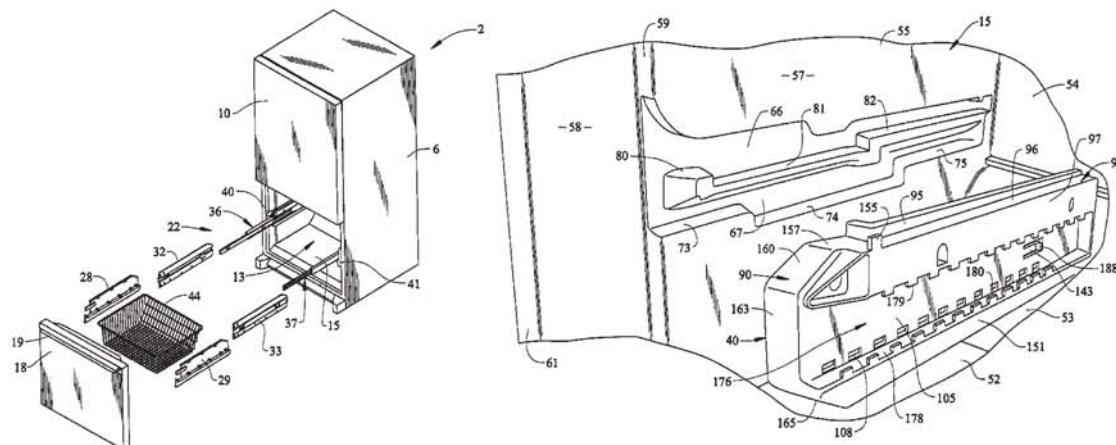
Primary Examiner—James O. Hansen

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(57) **ABSTRACT**

A freezer drawer support assembly is provided for a refrigerator including an upper fresh food compartment and a lower freezer compartment having a rearwardly tapering liner. The support assembly includes a pair of side adapters which compensate for the tapering of the liner, while defining both channels for the attachment of extensible drawer slides, to which a freezer door and a slidable basket is attached, and ledges for slidably supporting another basket. Preferably, the side adapters mate with groove and ledge structure formed into the liner to enhance the transfer of weight from the baskets, while enabling a refrigerator liner designed to directly support one or more slidable baskets to indirectly support multiple baskets which can be slid relative to each other.

20 Claims, 5 Drawing Sheets

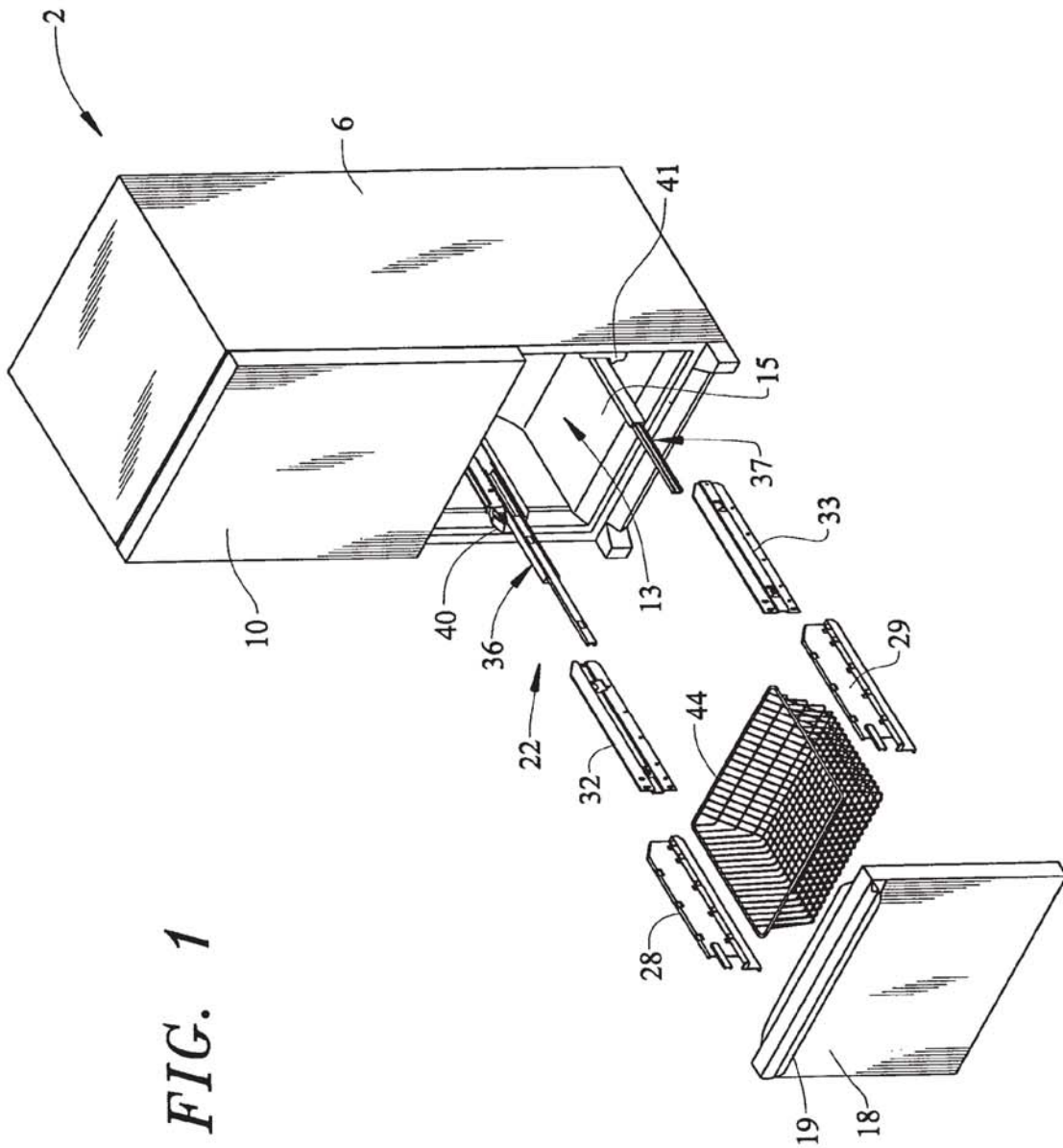


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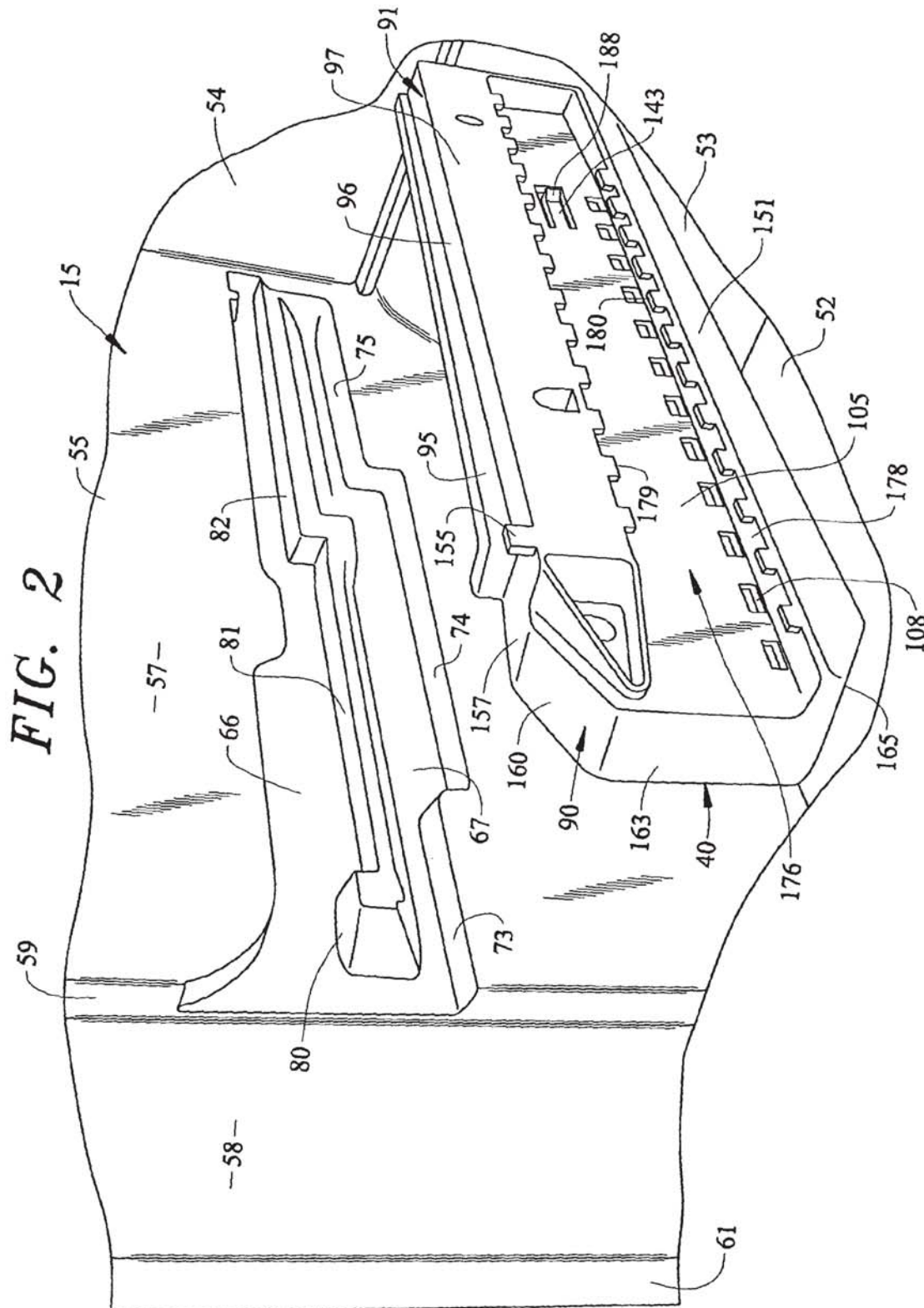


FIG. 3

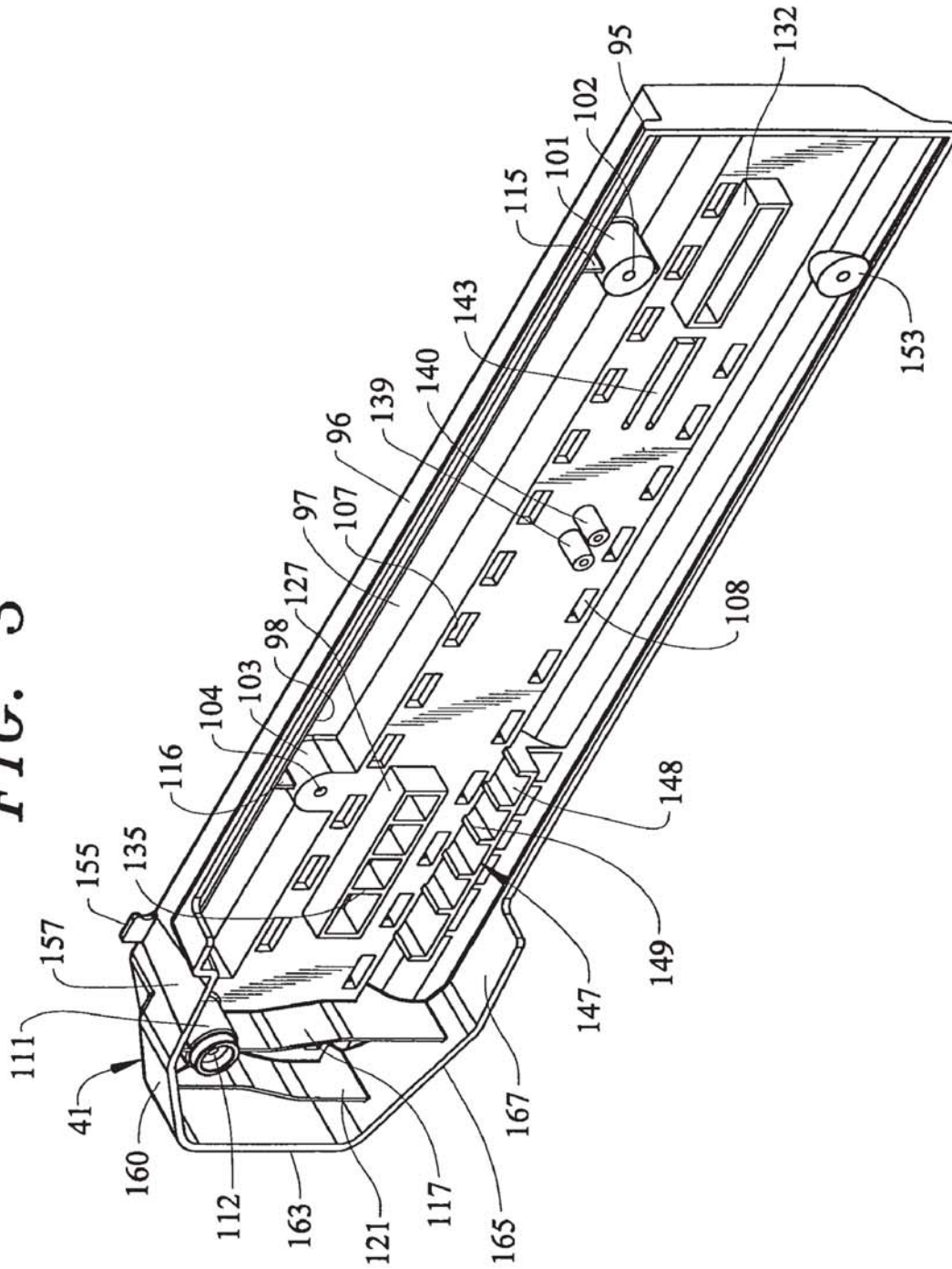
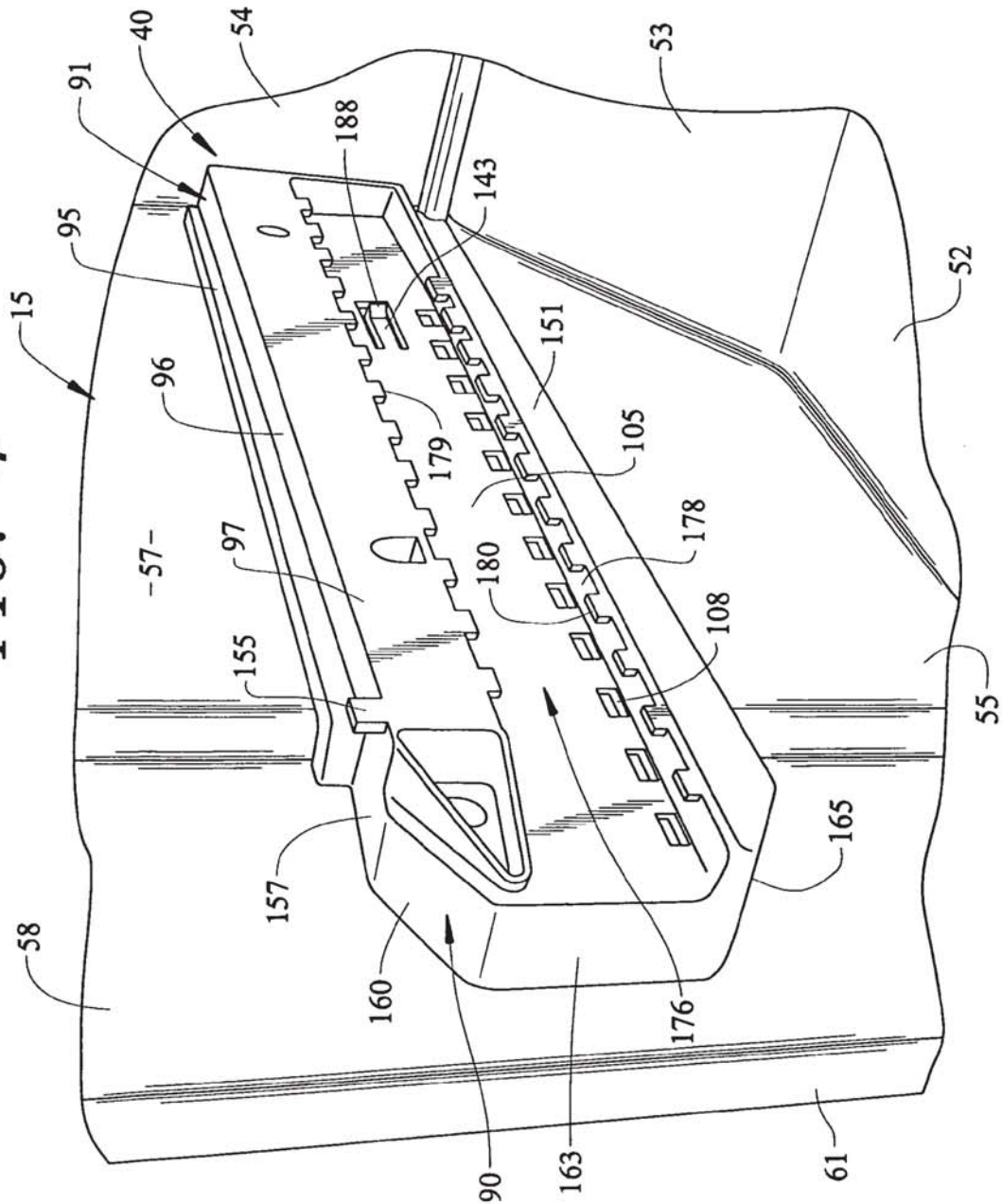


FIG. 4



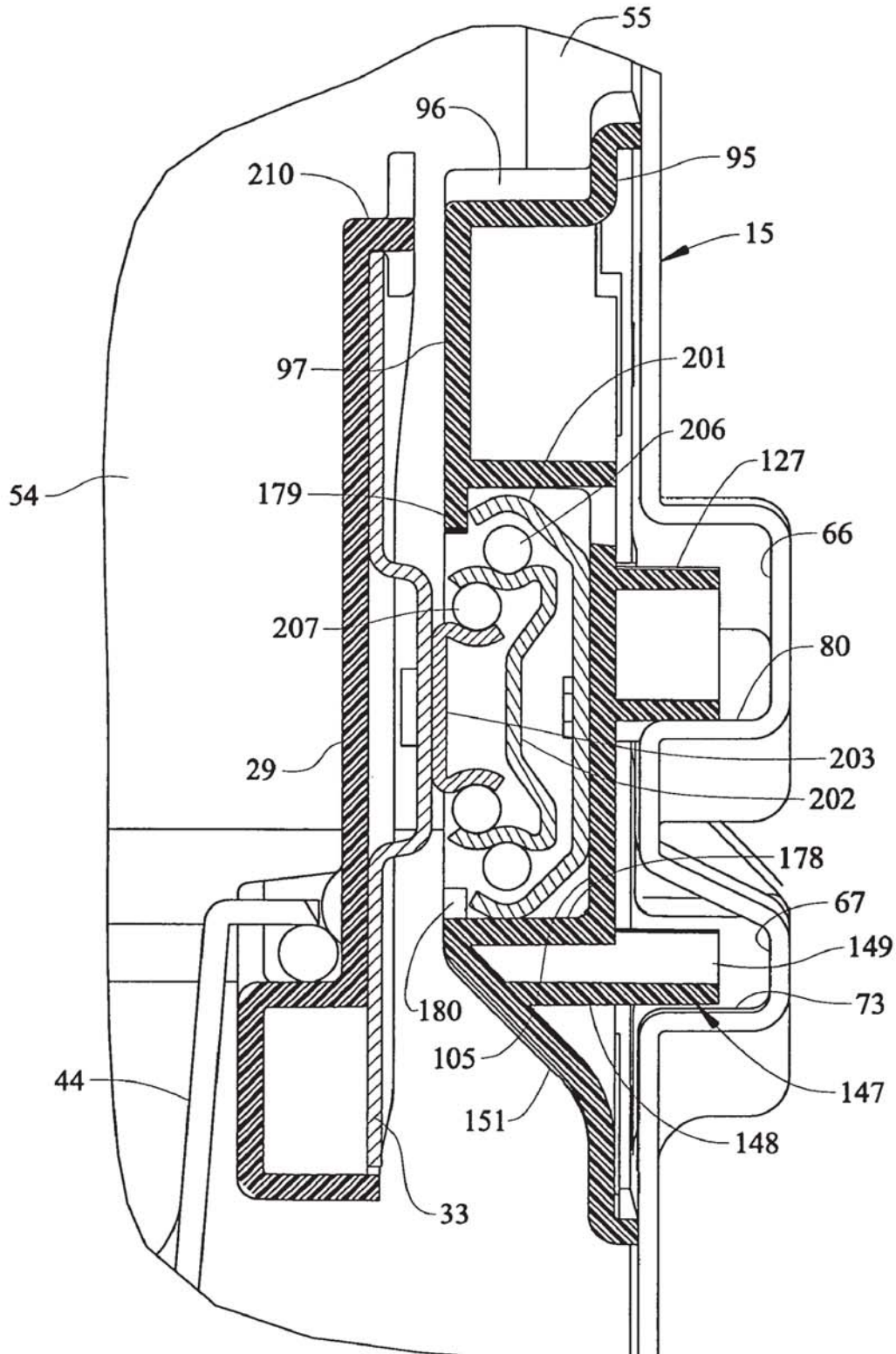
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FIG. 5



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FREEZER DRAWER SUPPORT ASSEMBLY**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application represents a continuation of U.S. patent application Ser. No. 10/379,584 filed Mar. 6, 2003 now U.S. Pat. No. 6,971,730 which claims the benefit to U.S. Provisional Application No. 60/364,108 filed on Mar. 15, 2002.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

The present invention pertains to the art of refrigerators and, more particularly, to a support arrangement for a pull-out freezer drawer.

2. Discussion of the Prior Art

There exist various styles of refrigerators on the market. Most common are side-by-side, top mount, and bottom mount models. In a side-by-side model, fresh food and freezer compartments are arranged laterally adjacent one another. A top mount refrigerator includes an upper freezer compartment and a lower fresh food compartment. Finally, bottom mount models have the fresh food compartment located above the freezer compartment.

In bottom mount models, it is known to employ both pivoting freezer doors and freezer doors which slide between open and closed positions. In a bottom mount style refrigerator including either a pivoting or sliding door, it is known to employ one or more sliding baskets to store food items within the freezer compartment. More specifically, in connection with a bottom mount refrigerator including a pivoting freezer door, it is known to thermoform a freezer compartment defining liner with integral side rails upon which one or more baskets can be directly slidably supported. In bottom mount refrigerators employing sliding doors, it is common to mount elongated support members to the opposing side walls of the freezer compartment through the use of mechanical fasteners, and then to support one or more baskets, either directly or indirectly, upon the support members. Typically, in this case, at least the support for one of the baskets is also connected to the door such that, as the door is slid relative to a cabinet of the refrigerator, the basket shifts into and out of the freezer compartment. Most commonly, these types of bottom mount refrigerators employ metal liners into which mechanical fasteners in the form of screws are secured to attach the support members.

Given construction and assembly variations between these different types of bottom mount refrigerators, completely different liners are required depending on whether a pivoting or sliding door arrangement is desired. Therefore, it is not possible to simply change a bottom mount refrigerator designed for use with a pivoting door to employ a sliding door arrangement. Based thereon, it would be beneficial to provide a supplemental adapter assembly which would enable a bottom mount refrigerator cabinet to be used with either pivoting or sliding doors and their associated basket arrangements.

SUMMARY OF THE INVENTION

The present invention is directed to a support assembly which is adapted to be fitted between rail structure formed in a thermoformed or injection molded freezer compartment liner of a bottom mount refrigerator in order to enable the refrigerator to be used with a slidably mounted freezer door/storage drawer combination. More specifically, a

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freezer compartment liner, formed with integral side rail structure that can directly, slidably support storage drawers or baskets, is adapted to receive side support adapters that enable the liner to be used in combination with a slidably freezer door which is interconnected to extensible slide structure for one or more drawers or baskets.

In accordance with the most preferred embodiment of the invention, each side support adapter includes upper and lower basket support structure. The lower basket support structure defines a channel which is adapted to snap-fittingly receive a drawer support slide member that is indirectly attached to a slidably freezer door of the refrigerator. The upper basket support structure is defined by a ledge on each of the side adapters which provides a support surface for an upper basket to slide independently of the lower basket. Projecting from a rear of each side support adapter are multiple lugs which are received within grooves or recesses defined in the liner and rest on substantially horizontal ledge portions through which vertical loads are transferred to the overall cabinet of the refrigerator. Each side adapter is preferably tapered from front to back to offset a tapering of the thermoformed or injection molded liner. In this manner, the opposing side adapters extend substantially parallel to each other. Mechanical fasteners are used to secure the side support adapters in place.

Additional objects, features and advantages of the present invention will become more readily apparent from the following detailed description of a preferred embodiment when taken in conjunction with the drawings wherein like reference numerals refer to corresponding parts in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial exploded view of a bottom mount style refrigerator incorporating the freezer drawer support assembly of the invention;

FIG. 2 is an enlarged view of a side wall portion of a liner provided in the refrigerator of FIG. 1, with a side adapter of the freezer drawer support assembly shown adjacent thereto prior to mounting;

FIG. 3 is a rear view of the side adapter of the freezer drawer support assembly of the invention;

FIG. 4 is a partial view of the side wall portion of FIG. 2, with the side adapter of the freezer drawer support assembly of the invention secured thereto; and

FIG. 5 is a cross-sectional view of the overall drawer support assembly of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With initial reference to FIG. 1, a refrigerator incorporating the invention is generally indicated at 2. Refrigerator 2 includes a cabinet shell 6 to which is attached a fresh food compartment door 10. At this point, it should be readily recognized that refrigerator 2 constitutes a bottom mount style refrigerator wherein fresh food compartment door 10 is adapted to seal off an upper fresh food compartment defined within cabinet shell 6. In a manner known in the art, fresh food compartment door 10 is preferably, pivotally mounted about a vertical axis to cabinet shell 6 through upper and lower hinges (not shown). Refrigerator 2 also includes a lower freezer compartment 13 which is defined by a liner 15. Freezer compartment 13 is adapted to be sealed by means of a freezer door 18 having an associated handle 19. In accordance with the present invention, freezer door 18 is adapted

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to slide towards and away from cabinet shell 6 through the use of a slide assembly generally indicated at 22 in order to selective access or seal freezer compartment 13.

As shown in this figure, slide assembly 22 generally includes a pair of opposing basket support plates 28 and 29 which are adapted to be fixedly secured to a rear portion of freezer door 18 through suitable brackets and fasteners (not shown). Basket support plates 28 and 29 respectively mate with a pair of door support plates 32 and 33 which, in turn, interconnect basket support plates 28 and 29 to respective extensible drawer slides 36 and 37. As will be detailed more fully below, drawer slides 36 and 37 are interconnected to liner 15 of freezer compartment 13 through respective side adapters 40 and 41. The present invention is particularly concerned with the inclusion, construction, and mounting of each side adapter 40, 41 as will be detailed below. FIG. 1 also illustrates a lower basket 44 which is adapted to be carried by basket support plates 28 and 29 so as to be shiftable into and out of freezer compartment 13 with the movement of freezer door 18.

FIG. 2 illustrates details of liner 15 and side adapter 40. In general, liner 15 includes a flat bottom portion 52, an inclined bottom portion 53, a rear wall 54, and opposing side walls 55. Each side wall 55 is shown to include an aft section 57 and a frontal section 58. In the preferred embodiment shown, aft and frontal sections 57 and 58 extend in different planes and are interconnected by an offset section 59. In any event, frontal section 58 leads to a frontal edge generally indicated at 61.

Formed in side wall 55, from offset section 59 to directly adjacent rear wall 54, is an elongated upper groove or recess 66, as well as a lower groove or recess 67. In general, upper and lower grooves 66 and 67 are formed in each side wall 55 in order to enable upper and lower baskets (not shown) to be slideably mounted within liner 15 when refrigerator 2 is utilized in combination with a pivoting freezer door. In accordance with the present invention, side adapters 40 and 41 are provided to mate with the structure of upper and lower grooves 66 and 67 in order to enable liner 15 to be utilized in connection with slideable freezer door 18 and slide assembly 22.

Based on the above, it should be recognized that, although the actual configuration of upper and lower grooves 66 and 67 can take various forms, the preferred form shown in FIG. 2 is known in the art for use in connection with a bottom mount refrigerator employing a pivotable freezer door and upper and lower freezer baskets. In any event, the actual configuration shown for upper and lower grooves 66 and 67 are perhaps best defined by the supporting structure associated therewith. Therefore, due to the inclusion of lower groove 67, side wall 55 is formed with a lower frontal ledge portion 73, an intermediate, lower ledge portion 74, and a lower, rear ledge portion 75. In addition, due to the presence of upper groove 66, side wall 55 defines an upper frontal ledge portion 80, an upper intermediate ledge portion 81, and an upper, rear ledge portion 82. Again, this structure enables an upper rim of a lower basket, and a lower rim of an upper basket to extend between the side walls 55 of liner 15 and be slideably mounted for movement into and out of freezer compartment 13. However, in accordance with the present invention, side adapters 40 and 41 are mounted utilizing the existing structure of side walls 55 to accommodate the overall slide assembly 22 in accordance with the invention.

Reference will now be made to FIGS. 2-4 in describing the construction of each side adapter 40, 41 of the present invention. At this initial stage, it should be noted that side

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adapters 40 and 41 are essentially mirror images of one another, such that the common structure will be described with respect to side adapter 40 shown in FIGS. 2 and 4 and side adapter 41 as shown in FIG. 3. In general, each side adapter 40, 41 includes a frontal section 90 and a rear section 91. As it is important to enable freezer door 18 to shift straight away from cabinet shell 6 and return to a position which establishes a proper seal, each side adapter 40, 41 is specifically constructed to accommodate for any divergence between side walls 55 of liner 15 in order that side adapters 40 and 41 define parallel paths for extensible drawer slides 36 and 37. Therefore, in accordance with the most preferred form of the invention, each side adapter 40, 41 slightly tapers from frontal section 90 to rear section 91 as indicated in these figures.

In any event, each side adapter 40, 41 is shown to include an upstanding wall 95 which follows the contour of side wall 55 from offset section 59 through aft section 57, with upstanding wall 95 leading to an upper ledge 96. In turn, upper ledge 96 leads to an upper wall 97 behind which is defined an elongated recess indicated at 98 in FIG. 3. Preferably defined within recess 98 is a first boss 101 provided with a hole 102, as well as a second boss 103 provided with a corresponding hole 104. Below upper wall 97 is provided a recessed, intermediate wall 105 that is shown to include an upper row of slots 107 and a lower row of slots 108. Located forward of recess 98 is a third boss 111 having an associated hole 112. As will be detailed more fully below, first, second and third bosses 101, 103 and 111 are adapted to receive mechanical fasteners through respective holes 102, 104 and 112 in mounting side adapters 40 and 41 to liner 15. For reinforcement purposes, a plurality of ribs, such as those indicated at 115-117 are provided as structural reinforcements around bosses 101, 103 and 111 respectively. An additional structural reinforcement 121 is preferably provided forward of third boss 111 as well.

In the most preferred form of the invention, each side adapter 40, 41 is injection molded of plastic. Most preferably, when forming each side adapter 40, 41, intermediate wall 105 is integrally formed with an upper frontal lug 127 and a rear lug 132. In the most preferred form of the invention, each of upper frontal lug 127 and rear 132 is generally boxed-shaped, with at least upper frontal lug 127 being provided with various cross supports 135. Also formed along intermediate wall 105 is a pair of central bosses 139 and 140, as well as a cantilevered member 143.

Below intermediate wall 105, and preferably beneath upper frontal lug 127, is a lower frontal lug 147. In accordance with the embodiment shown, lower frontal lug 147 includes a main plate portion 148 from which extend a plurality of ribs 149. Also arranged below intermediate wall 105 is a lower wall 151 which is shown to be formed with a fourth boss 153.

As shown in FIGS. 2-4, upper ledge 96 has projecting therefrom an upstanding stop 155. Upstanding stop 155 is spaced from upstanding wall 95 by upper ledge 96. Adjacent upstanding stop 155, upper ledge 96 leads to a lateral section 157 of a respective side adapter 40, 41. Lateral section 157 forms part of frontal section 90 and leads to a forwardly sloping section 160, a front face section 163, a rearwardly sloping section 165, and a short bottom section 167. With this overall construction, each side adapter 40, 41 defines a channel 176 that extends along intermediate wall 105 and which defines a lower ledge 178. Channel 176 is also defined, at least laterally, by an upper row of teeth members 179 and a lower row of teeth members 180. As clearly shown in these figures, cantilevered member 143 is exposed to

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channel 176 and is provided at a rear end thereof with a wedge section 188 which projects into channel 176.

During assembly of refrigerator 2, liner 15 is preferably thermoformed with upper and lower grooves 66 and 67. With this construction, liner 15 can be used to directly, slideably support upper and lower freezer baskets when refrigerator 2 is used in combination with a pivoting freezer door. However, in accordance with the present invention wherein freezer door 15 is slideable relative to cabinet shell 6, each side wall 55 has mounted thereon a respective side adapter 40, 41. In mounting each side adapter 40, 41, upper frontal lug 127 is positioned to rest upon upper frontal ledge portion 80, rear lug 132 is positioned upon upper rear ledge portion 82, and lower frontal lug 147 sets upon lower frontal ledge portion 73. The resting of upper frontal lug 127 and lower frontal lug 147 in this manner is seen to be clearly illustrated in FIG. 5.

Due to the construction of each side adapter 40, 41, frontal section 90 is made to conform to frontal section 58, as well as offset section 59, of a respective side wall 55. Correspondingly, rear section 91 conforms to aft section 57 of side wall 55. Once supported in this fashion, mechanical fasteners (not shown) are extended through holes 102, 104 and 112 in bosses 101, 103 and 111 in order to fixedly secure each side adapter 40, 41 to a respective side wall 55. Most preferably, refrigerator 2 is provided with mounting structure, such as in the form of plates, which are arranged behind liner 15 at the location of at least bosses 101, 103 and 111, with this mounting structure being rigidly maintained in a desired position upon the curing of foamed insulation injected between cabinet shell 6 and liner 15 in a manner known in the art. Therefore, the threaded fasteners associated with bosses 101, 103 and 111 extend not only through liner 15 but also into additional mounting structure to secure each side adapter 40, 41 in place. If desired, an additional fastening point can be established at fourth boss 153.

Once side adapters 40 and 41 are mounted in this fashion, each drawer slide 36, 37 can be secured to a respective side adapter 40, 41 within channel 176. More specifically, each drawer slide 36, 37 is slid upon a respective lower ledge 178, between intermediate wall 105 and the upper and lower rows of teeth members 179 and 180. As best shown in FIG. 5, each drawer slide 36, 37 preferably includes an outermost cabinet member 201, an intermediate member 202 and a drawer member 203. Interposed between cabinet member 201 and intermediate member 202 are respective ball bearings 206. Similarly, ball bearings 207 are provided between intermediate member 202 and drawer member 203.

In any event, each drawer slide 36, 37 is adapted to be mounted within a respective channel 176. As cabinet member 201 reaches cantilevered member 143, the abutment with wedge section 188 will cause cantilever member 143 to deflect inward, thereby allowing at least a portion of cabinet member 201 to pass cantilever member 143. Although not shown in these figures, cabinet member 201 preferably includes an aperture which becomes aligned with wedge section 188 upon full insertion of slide assembly 22 within channel 176 such that cantilevered member 143 will be caused to again deflect to the position shown in FIGS. 2 and 4, thereby selectively retaining drawer slide 36, 37 in position. Actually, there is preferably a rather snug fit between drawer member 201 and channel 176 as generally represented in FIG. 5.

As also shown in this figure, drawer member 203 is fixedly secured to a respective door support plate 32, 33 which, in turn, is interconnected to a respective basket support plate 28, 29. Since each basket support plate 28, 29

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is secured to freezer door 18, when freezer door 18 is pulled away from cabinet shell 6, basket support plates 28 and 29 and door support plates 32 and 33 will be drawn out of freezer compartment 13 with drawer member 203. Drawer member 203 will be shifted relative to intermediate member 202 due to the arrangement of ball bearings 207. When drawer member 203 reaches a fully extended position, then both drawer member 203 and intermediate member 202 will extend relative to cabinet shell 6 and cabinet member 201. Eventually, extensible drawer slides 36 and 37 will achieve their maximum extended position, at which point at least basket 44 is fully exposed outside of freezer compartment 13.

Based on the above description, it should be readily apparent that the inclusion of side adapters 40 and 41 not only enable the use of a common liner 15 on various model refrigerators, but accommodates the tapering of side walls 55 to assure that extensible drawer slides 36 and 37 will extend parallel to one another. The incorporation, structure and positioning of lugs 127, 132 and 147 enable each side adapter 40, 41 to nest in the existing geometry formed into liner 15 either through a thermoforming or injection molding process. Therefore, lugs 127, 132 and 147 transfer vertical loads directly to the overall foamed refrigerator assembly which is considered to be extremely advantageous, as opposed to hanging side adapters 40, 41 from liner 15 solely through the use of screws and anchors. The inclusion of cantilevered member 143 and wedge section 188 advantageously provides a snap feature for the mounting of a respective drawer slide 36, 37 and prevents the drawer slide 36, 37 from undesirably sliding forward. Upper ledge 96 on each side adapter 40, 41 establishes a setting surface for an upper basket (not shown) which can slide independently of drawer slides 36 and 37. This configuration is considered to allow a greater range of motion for an upper basket. When such an upper basket is employed, it should be noted that the basket can be drawn out to also rest upon an uppermost edge 210 of basket support plates 28 and 29.

Although described with reference to a preferred embodiment of the invention, it should be readily understood that various changes and/or modifications can be made to the invention without departing from the spirit thereof. For instance, it should be readily apparent that side adapters 40 and 41 have been configured based on the preferred construction shown for side walls 55 of liner 15. This configuration is currently used in connection with a freezer compartment 13 of approximately 33 inches wide. On more narrow models wherein only a single basket may be utilized, only a single groove may be provided in the liner. Therefore, the actual configuration of the side adapters and the number of lugs for supporting the same would correspondingly change. Of course, it is also known to produce refrigerator liners with inwardly projecting rails and a side adapter in accordance with the present invention could also be configured for use with this type of arrangement. Regardless, given that the invention is intended for use in connection with a slideable freezer door 18, it is important to maintain the parallel relationship between the respective channels 176 and therefore side adapters 40 and 41 must be constructed in such a manner as to compensate for variations in the lateral dimensions of the freezer liner, such as in cases where the freezer liner tapers from front to rear. In any event, side adapters 40 and 41 can advantageously define support structure for multiple baskets and are integrally formed with lug structure which effectively transfers vertical loading. In general, the invention is only intended to be limited by the scope of the following claims.

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I claim:

1. A refrigerator comprising:

an upper fresh food compartment having an associated fresh food compartment door;

a lower freezer compartment having an associated freezer compartment door, said freezer compartment being defined by a liner including opposing side walls having a respective laterally outwardly projecting offset sections;

a freezer drawer support assembly including first and second side adapters, each having a respective front section and a respective channel, and a pair of extensible drawer slides, each of said first and second side adapters being mounted to respective ones of the opposing side walls with a portion of the front section extending forward of and about the offset section, said pair of extensible drawer slides being mounted in the channels of the first and second side adapters, said freezer door being connected to the extensible drawer slides for fore-to-aft movement in order to selectively provide access to the freezer compartment; and
a basket slidably supported by first and second side adapters.

2. The refrigerator according to claim 1, wherein each of the opposing side walls of the liner includes at least one groove defining a ledge portion and each of said first and second side adapters is provided with a plurality of lugs extending from a rear section thereof, said plurality of lugs extending into the at least one groove and nesting with the ledge portion.

3. The refrigerator according to claim 1, wherein each of the first and second side adapters includes a plurality of bosses which receive mechanical fasteners for fixing each of the first and second side adapters to the liner.

4. The refrigerator according to claim 1, wherein each of the first and second side adapters includes an upper wall, a lower wall and an intermediate wall, said intermediate wall being recessed relative to the upper and lower walls so as to define the channel.

5. The refrigerator according to claim 4, further comprising: a plurality of spaced teeth members extending from each of the upper and lower walls, said channel being defined laterally between the intermediate wall and the plurality of spaced teeth members.

6. The refrigerator according to claim 1, further comprising: a member cantilevered from the first side adapter and projecting into the channel for snap-fittingly engaging a respective one of the drawer slides.

7. The refrigerator according to claim 1, wherein the opposing side walls of the liner taper fore-to-aft such that a distance between the opposing side walls at a front portion of the freezer compartment is greater than a distance between the opposing side walls at a rear portion of the freezer compartment.

8. A refrigerator comprising:

an upper fresh food compartment having an associated fresh food compartment door;

a lower freezer compartment having an associated freezer compartment door, said freezer compartment being defined by a liner including opposing side walls; and
a freezer drawer support assembly including:

first and second side adapters, each having a front section and a channel, mounted to respective ones of the opposing side walls, each of said first and second side adapters being provided with a cantilevered member located within a respective said channel; and

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a pair of extensible drawer slides snap-fittingly attached to the cantilevered members in the channels of the first and second side adapters, said freezer compartment door being connected to the extensible drawer slides for fore-to-aft movement relative to the liner in order to selectively provide access to the freezer compartment.

9. The refrigerator according to claim 8, wherein each of the extensible drawer slides includes a cabinet member, an intermediate member and a drawer member which are extensibly interconnected.

10. The refrigerator according to claim 9, further comprising: a wedge section provided on each cantilevered member, said wedge section snap-fittingly engaging the cabinet member to retain a respective one of the extensible drawer slides in a respective channel.

11. The refrigerator according to claim 8, wherein each of the first and second side adapters includes an upper wall, a lower wall and an intermediate wall, said intermediate wall being recessed relative to the upper and lower walls so as to define the channel.

12. The refrigerator according to claim 11, further comprising: a plurality of spaced teeth members extending from each of the upper and lower walls, said channel being defined laterally between the intermediate wall and the plurality of spaced teeth members.

13. The refrigerator according to claim 8, wherein the opposing side walls of the liner taper fore-to-aft such that a distance between the opposing side walls at a front portion of the freezer compartment is greater than a distance between the opposing side walls at a rear portion of the freezer compartment.

14. The refrigerator according to claim 8, further comprising:

a pair of basket support plates fixed to the freezer door; and
a basket slidably supported by the pair of basket support plates.

15. In a refrigerator including an upper fresh food compartment having an associated fresh food compartment door and a lower freezer compartment having an associated freezer compartment door, with said freezer compartment being defined by a liner including opposing side walls having a laterally outwardly projecting offset section, a method of mounting a freezer drawer support assembly comprising:

mounting first and second side adapters on respective ones of the opposing side walls, each of said first and second side adapters including a front face section and a channel;

positioning a portion of the front face section of each of the first and second side adapters upon the laterally outwardly projecting offset section to establish a desired parallel alignment of the channels; and

attaching first and second extensible drawer slides in the channels of the first and second side adapters, with the freezer compartment door being connected to the pair of extensible drawer slides for sliding movement relative to the liner.

16. The method of claim 15, further comprising: snap-fitting the first and second extensible drawer slides in corresponding ones of the channels of the first and second side adapters.

17. The method of claim 15, wherein the first and second extensible drawer slides are snap-fittingly secured in corresponding ones of the channels of the first and second side adapters through respective cantilevered members.

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18. The method of claim 15, further comprising: positioning the first and second extensible drawer slides vertically between upper and lower walls, and laterally between an intermediate wall and a plurality of teeth members, formed on each of the first and second side adapters.

19. The method of claim 15, further comprising: fixing each of the first and second side adapters within the freezer compartment with the side adapters tapering from back to front in order to compensate for a front to rear tapering of the

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side walls of the freezer compartment such that the first and second extensible drawer slides are arranged substantially parallel to each other.

20. The method of claim 15, further comprising: attaching basket support plates to respective ones of the first and second extensible drawer slides; and slidably supporting a basket on the basket support plates.

* * * * *

UNITED STATES DISTRICT COURT

District of

New Jersey

LG ELECTRONICS U.S.A., INC.,
LG ELECTRONICS, INC., et al.

SUMMONS IN A CIVIL ACTION

V.

WHIRLPOOL CORPORATION,
WHIRLPOOL PATENTS COMPANY, et al.

CASE NUMBER:

TO: (Name and address of Defendant)

MAYTAG CORPORATION
2000 North M-63
Benton Harbor, MI 49022

YOU ARE HEREBY SUMMONED and required to serve on PLAINTIFF'S ATTORNEY (name and address)

Thomas R. Curtin
GRAHAM CURTIN
A Professional Association
4 Headquarters Plaza
P.O. Box 1991
Morristown, NJ 07962-1991

an answer to the complaint which is served on you with this summons, within 20 days after service of this summons on you, exclusive of the day of service. If you fail to do so, judgment by default will be taken against you for the relief demanded in the complaint. Any answer that you serve on the parties to this action must be filed with the Clerk of this Court within a reasonable period of time after service.

CLERK

DATE

(By) DEPUTY CLERK

AO 440 (Rev. 8/01) Summons in a Civil Action

RETURN OF SERVICE		
Service of the Summons and complaint was made by me ⁽¹⁾	DATE	
NAME OF SERVER (<i>PRINT</i>)	TITLE	
<i>Check one box below to indicate appropriate method of service</i>		
<div style="margin-bottom: 10px;"> <input type="checkbox"/> Served personally upon the defendant. Place where served: </div> <div style="margin-bottom: 10px;"> <input type="checkbox"/> Left copies thereof at the defendant's dwelling house or usual place of abode with a person of suitable age and discretion then residing therein. Name of person with whom the summons and complaint were left: </div> <div style="margin-bottom: 10px;"> <input type="checkbox"/> Returned unexecuted: </div> <div> <input type="checkbox"/> Other (specify): </div>		
STATEMENT OF SERVICE FEES		
TRAVEL	SERVICES	TOTAL \$0.00
DECLARATION OF SERVER		
<p>I declare under penalty of perjury under the laws of the United States of America that the foregoing information contained in the Return of Service and Statement of Service Fees is true and correct.</p> <p>Executed on _____ Date _____ <i>Signature of Server</i> _____</p> <p style="text-align: center;">_____ <i>Address of Server</i></p>		

(1) As to who may serve a summons see Rule 4 of the Federal Rules of Civil Procedure.

AO 440 (Rev. 8/01) Summons in a Civil Action

UNITED STATES DISTRICT COURT

District of

New Jersey

LG ELECTRONICS U.S.A., INC.,
LG ELECTRONICS, INC., et al.

SUMMONS IN A CIVIL ACTION

V.
WHIRLPOOL CORPORATION,
WHIRLPOOL PATENTS COMPANY, et al.

CASE NUMBER:

TO: (Name and address of Defendant)

WHIRLPOOL CORPORATION
2000 North M-63
Benton Harbor, MI 49022

YOU ARE HEREBY SUMMONED and required to serve on PLAINTIFF'S ATTORNEY (name and address)

Thomas R. Curtin
GRAHAM CURTIN
A Professional Association
4 Headquarters Plaza
P.O. Box 1991
Morristown, NJ 07962-1991

an answer to the complaint which is served on you with this summons, within 20 days after service of this summons on you, exclusive of the day of service. If you fail to do so, judgment by default will be taken against you for the relief demanded in the complaint. Any answer that you serve on the parties to this action must be filed with the Clerk of this Court within a reasonable period of time after service.

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STATEMENT OF SERVICE FEES		
TRAVEL	SERVICES	TOTAL \$0.00
DECLARATION OF SERVER		
<p>I declare under penalty of perjury under the laws of the United States of America that the foregoing information contained in the Return of Service and Statement of Service Fees is true and correct.</p> <p>Executed on _____ <div style="display: flex; justify-content: space-around; width: 100%;"> Date Signature of Server </div> <div style="text-align: center;"> _____ Address of Server </div> </p>		

(1) As to who may serve a summons see Rule 4 of the Federal Rules of Civil Procedure.

AO 440 (Rev. 8/01) Summons in a Civil Action

UNITED STATES DISTRICT COURT

District of

New Jersey

LG ELECTRONICS U.S.A., INC.,
LG ELECTRONICS, INC., et al.

SUMMONS IN A CIVIL ACTION

V.

WHIRLPOOL CORPORATION,
WHIRLPOOL PATENTS COMPANY, et al.

CASE NUMBER:

TO: (Name and address of Defendant)

WHIRLPOOL MANUFACTURING CORPORATION
500 Renaissance Drive, Suite 102
St. Joseph, MI 49085

YOU ARE HEREBY SUMMONED and required to serve on PLAINTIFF'S ATTORNEY (name and address)

Thomas R. Curtin
GRAHAM CURTIN
A Professional Association
4 Headquarters Plaza
P.O. Box 1991
Morristown, NJ 07962-1991

an answer to the complaint which is served on you with this summons, within 20 days after service of this summons on you, exclusive of the day of service. If you fail to do so, judgment by default will be taken against you for the relief demanded in the complaint. Any answer that you serve on the parties to this action must be filed with the Clerk of this Court within a reasonable period of time after service.

CLERK

DATE

(By) DEPUTY CLERK

AO 440 (Rev. 8/01) Summons in a Civil Action

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<div style="margin-bottom: 10px;"> <input type="checkbox"/> Served personally upon the defendant. Place where served: </div> <div style="margin-bottom: 10px;"> <input type="checkbox"/> Left copies thereof at the defendant's dwelling house or usual place of abode with a person of suitable age and discretion then residing therein. Name of person with whom the summons and complaint were left: </div> <div style="margin-bottom: 10px;"> <input type="checkbox"/> Returned unexecuted: </div> <div> <input type="checkbox"/> Other (specify): </div>		
STATEMENT OF SERVICE FEES		
TRAVEL	SERVICES	TOTAL \$0.00
DECLARATION OF SERVER		
<p>I declare under penalty of perjury under the laws of the United States of America that the foregoing information contained in the Return of Service and Statement of Service Fees is true and correct.</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> Executed on _____ Date </div> <div style="width: 60%;"> _____ <i>Signature of Server</i> </div> </div> <div style="text-align: center; margin-top: 20px;"> _____ <i>Address of Server</i> </div>		

(1) As to who may serve a summons see Rule 4 of the Federal Rules of Civil Procedure.

AO 440 (Rev. 8/01) Summons in a Civil Action

UNITED STATES DISTRICT COURT

District of

New Jersey

LG ELECTRONICS U.S.A., INC.,
LG ELECTRONICS, INC., et al.

SUMMONS IN A CIVIL ACTION

V.

WHIRLPOOL CORPORATION,
WHIRLPOOL PATENTS COMPANY, et al.

CASE NUMBER:

TO: (Name and address of Defendant)

WHIRLPOOL PATENTS COMPANY
500 Renaissance Drive, Suite 102
St. Joseph, MI 49085

YOU ARE HEREBY SUMMONED and required to serve on PLAINTIFF'S ATTORNEY (name and address)

Thomas R. Curtin
GRAHAM CURTIN
A Professional Association
4 Headquarters Plaza
P.O. Box 1991
Morristown, NJ 07962-1991

an answer to the complaint which is served on you with this summons, within 20 days after service of this summons on you, exclusive of the day of service. If you fail to do so, judgment by default will be taken against you for the relief demanded in the complaint. Any answer that you serve on the parties to this action must be filed with the Clerk of this Court within a reasonable period of time after service.

CLERK

DATE

(By) DEPUTY CLERK

AO 440 (Rev. 8/01) Summons in a Civil Action

RETURN OF SERVICE		
Service of the Summons and complaint was made by me ⁽¹⁾	DATE	
NAME OF SERVER (<i>PRINT</i>)	TITLE	
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<div style="margin-bottom: 10px;"><input type="checkbox"/> Served personally upon the defendant. Place where served:</div> <div style="margin-bottom: 10px;"> <input type="checkbox"/> Left copies thereof at the defendant's dwelling house or usual place of abode with a person of suitable age and discretion then residing therein. Name of person with whom the summons and complaint were left: </div> <div style="margin-bottom: 10px;"><input type="checkbox"/> Returned unexecuted:</div> <div><input type="checkbox"/> Other (specify):</div>		
STATEMENT OF SERVICE FEES		
TRAVEL	SERVICES	TOTAL \$0.00
DECLARATION OF SERVER		
<p>I declare under penalty of perjury under the laws of the United States of America that the foregoing information contained in the Return of Service and Statement of Service Fees is true and correct.</p> <p>Executed on _____ Date _____ Signature of Server _____</p> <p style="text-align: center;">_____ Address of Server</p>		

(1) As to who may serve a summons see Rule 4 of the Federal Rules of Civil Procedure.

JS 44 (Rev. 12/07, NJ 1/08)

CIVIL COVER SHEET

The JS 44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)

I. (a) PLAINTIFFS

DEFENDANTS

(b) County of Residence of First Listed Plaintiff BERGENCounty of Residence of First Listed Defendant (State of Michigan)

NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE LAND INVOLVED.

(c) Attorney's (Firm Name, Address, Telephone Number, and Email Address)

Graham Curtin, A Professional Association, 4 Headquarters Plaza,
P.O. Box 1991, Morristown, NJ 07962-1991

Attorneys (If Known)

II. BASIS OF JURISDICTION (Place an "X" in One Box Only)

- ☐ 1 U.S. Government Plaintiff
- ☒ 3 Federal Question (U.S. Government Not a Party)
- ☐ 2 U.S. Government Defendant
- ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (Place an "X" in One Box for Plaintiff and One Box for Defendant)

- | | PTF | DEF | | PTF | DEF |
|---|----------------------------|----------------------------|---|---------------------------------------|---------------------------------------|
| Citizen of This State | <input type="checkbox"/> 1 | <input type="checkbox"/> 1 | Incorporated or Principal Place of Business In This State | <input checked="" type="checkbox"/> 4 | <input type="checkbox"/> 4 |
| Citizen of Another State | <input type="checkbox"/> 2 | <input type="checkbox"/> 2 | Incorporated and Principal Place of Business In Another State | <input type="checkbox"/> 5 | <input checked="" type="checkbox"/> 5 |
| Citizen or Subject of a Foreign Country | <input type="checkbox"/> 3 | <input type="checkbox"/> 3 | Foreign Nation | <input type="checkbox"/> 6 | <input type="checkbox"/> 6 |

IV. NATURE OF SUIT (Place an "X" in One Box Only)

CONTRACT	TORTS	FORFEITURE/PENALTY	BANKRUPTCY	OTHER STATUTES
<input type="checkbox"/> 110 Insurance <input type="checkbox"/> 120 Marine <input type="checkbox"/> 130 Miller Act <input type="checkbox"/> 140 Negotiable Instrument <input type="checkbox"/> 150 Recovery of Overpayment & Enforcement of Judgment <input type="checkbox"/> 151 Medicare Act <input type="checkbox"/> 152 Recovery of Defaulted Student Loans (Excl. Veterans) <input type="checkbox"/> 153 Recovery of Overpayment of Veteran's Benefits <input type="checkbox"/> 160 Stockholders' Suits <input type="checkbox"/> 190 Other Contract <input type="checkbox"/> 195 Contract Product Liability <input type="checkbox"/> 196 Franchise	PERSONAL INJURY <input type="checkbox"/> 310 Airplane <input type="checkbox"/> 315 Airplane Product Liability <input type="checkbox"/> 320 Assault, Libel & Slander <input type="checkbox"/> 330 Federal Employers' Liability <input type="checkbox"/> 340 Marine <input type="checkbox"/> 345 Marine Product Liability <input type="checkbox"/> 350 Motor Vehicle <input type="checkbox"/> 355 Motor Vehicle Product Liability <input type="checkbox"/> 360 Other Personal Injury PERSONAL INJURY <input type="checkbox"/> 362 Personal Injury - Med. Malpractice <input type="checkbox"/> 365 Personal Injury - Product Liability <input type="checkbox"/> 368 Asbestos Personal Injury Product Liability PERSONAL PROPERTY <input type="checkbox"/> 370 Other Fraud <input type="checkbox"/> 371 Truth in Lending <input type="checkbox"/> 380 Other Personal Property Damage <input type="checkbox"/> 385 Property Damage Product Liability	<input type="checkbox"/> 610 Agriculture <input type="checkbox"/> 620 Other Food & Drug <input type="checkbox"/> 625 Drug Related Seizure of Property 21 USC 881 <input type="checkbox"/> 630 Liquor Laws <input type="checkbox"/> 640 R.R. & Truck <input type="checkbox"/> 650 Airline Regs. <input type="checkbox"/> 660 Occupational Safety/Health <input type="checkbox"/> 690 Other LABOR <input type="checkbox"/> 710 Fair Labor Standards Act <input type="checkbox"/> 720 Labor/Mgmt. Relations <input type="checkbox"/> 730 Labor/Mgmt. Reporting & Disclosure Act <input type="checkbox"/> 740 Railway Labor Act <input type="checkbox"/> 790 Other Labor Litigation <input type="checkbox"/> 791 Empl. Ret. Inc. Security Act IMMIGRATION <input type="checkbox"/> 462 Naturalization Application <input type="checkbox"/> 463 Habeas Corpus - Alien Detainee <input type="checkbox"/> 465 Other Immigration Actions	<input type="checkbox"/> 422 Appeal 28 USC 158 <input type="checkbox"/> 423 Withdrawal 28 USC 157 PROPERTY RIGHTS <input type="checkbox"/> 820 Copyrights <input checked="" type="checkbox"/> 830 Patent <input type="checkbox"/> 840 Trademark SOCIAL SECURITY <input type="checkbox"/> 861 HIA (1395ff) <input type="checkbox"/> 862 Black Lung (923) <input type="checkbox"/> 863 DIWC/DIWW (405(g)) <input type="checkbox"/> 864 SSID Title XVI <input type="checkbox"/> 865 RSI (405(g)) FEDERAL TAX SUITS <input type="checkbox"/> 870 Taxes (U.S. Plaintiff or Defendant) <input type="checkbox"/> 871 IRS—Third Party 26 USC 7609	<input type="checkbox"/> 400 State Reapportionment <input type="checkbox"/> 410 Antitrust <input type="checkbox"/> 430 Banks and Banking <input type="checkbox"/> 450 Commerce <input type="checkbox"/> 460 Deportation <input type="checkbox"/> 470 Racketeer Influenced and Corrupt Organizations <input type="checkbox"/> 480 Consumer Credit <input type="checkbox"/> 490 Cable/Sat TV <input type="checkbox"/> 810 Selective Service <input type="checkbox"/> 850 Securities/Commodities/Exchange <input type="checkbox"/> 875 Customer Challenge 12 USC 3410 <input type="checkbox"/> 890 Other Statutory Actions <input type="checkbox"/> 891 Agricultural Acts <input type="checkbox"/> 892 Economic Stabilization Act <input type="checkbox"/> 893 Environmental Matters <input type="checkbox"/> 894 Energy Allocation Act <input type="checkbox"/> 895 Freedom of Information Act <input type="checkbox"/> 900 Appeal of Fee Determination Under Equal Access to Justice <input type="checkbox"/> 950 Constitutionality of State Statutes
REAL PROPERTY <input type="checkbox"/> 210 Land Condemnation <input type="checkbox"/> 220 Foreclosure <input type="checkbox"/> 230 Rent Lease & Ejectment <input type="checkbox"/> 240 Torts to Land <input type="checkbox"/> 245 Tort Product Liability <input type="checkbox"/> 290 All Other Real Property	CIVIL RIGHTS <input type="checkbox"/> 441 Voting <input type="checkbox"/> 442 Employment <input type="checkbox"/> 443 Housing/Accommodations <input type="checkbox"/> 444 Welfare <input type="checkbox"/> 445 Amer. w/Disabilities - Employment <input type="checkbox"/> 446 Amer. w/Disabilities - Other <input type="checkbox"/> 440 Other Civil Rights	PRISONER PETITIONS <input type="checkbox"/> 510 Motions to Vacate Sentence Habeas Corpus: <input type="checkbox"/> 530 General <input type="checkbox"/> 535 Death Penalty <input type="checkbox"/> 540 Mandamus & Other <input type="checkbox"/> 550 Civil Rights <input type="checkbox"/> 555 Prison Condition		

V. ORIGIN

(Place an "X" in One Box Only)

- ☒ 1 Original Proceeding
- ☐ 2 Removed from State Court
- ☐ 3 Remanded from Appellate Court
- ☐ 4 Reinstated or Reopened
- ☐ 5 Transferred from another district (specify)
- ☐ 6 Multidistrict Litigation
- ☐ 7 Appeal to District Judge from Magistrate Judgment

VI. CAUSE OF ACTION

Cite the U.S. Civil Statute under which you are filing (Do not cite jurisdictional statutes unless diversity):
United States Code, Title 35, 28 U.S.C. Section 2201

Brief description of cause:

Declaratory judgment action as to non-infringement, invalidity and unenforceability of patents

VII. REQUESTED IN COMPLAINT:

☐ CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23

DEMAND \$

CHECK YES only if demanded in complaint:

JURY DEMAND: ☐ Yes ☒ No

VIII. RELATED CASE(S)

(See instructions):

JUDGE

DOCKET NUMBER

Explanation:

4-16-2008

DATE

SIGNATURE OF ATTORNEY OF RECORD

INSTRUCTIONS FOR ATTORNEYS COMPLETING CIVIL COVER SHEET FORM JS 44**Authority For Civil Cover Sheet**

The JS 44 civil cover sheet and the information contained herein neither replaces nor supplements the filings and service of pleading or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. Consequently, a civil cover sheet is submitted to the Clerk of Court for each civil complaint filed. The attorney filing a case should complete the form as follows:

I. (a) Plaintiffs-Defendants. Enter names (last, first, middle initial) of plaintiff and defendant. If the plaintiff or defendant is a government agency, use only the full name or standard abbreviations. If the plaintiff or defendant is an official within a government agency, identify first the agency and then the official, giving both name and title.

(b) County of Residence. For each civil case filed, except U.S. plaintiff cases, enter the name of the county where the first listed plaintiff resides at the time of filing. In U.S. plaintiff cases, enter the name of the county in which the first listed defendant resides at the time of filing. (NOTE: In land condemnation cases, the county of residence of the "defendant" is the location of the tract of land involved.)

(c) Attorneys. Enter the firm name, address, telephone number, and attorney of record. If there are several attorneys, list them on an attachment, noting in this section "(see attachment)".

II. Jurisdiction. The basis of jurisdiction is set forth under Rule 8(a), F.R.C.P., which requires that jurisdictions be shown in pleadings. Place an "X" in one of the boxes. If there is more than one basis of jurisdiction, precedence is given in the order shown below.

United States plaintiff. (1) Jurisdiction based on 28 U.S.C. 1345 and 1348. Suits by agencies and officers of the United States are included here.

United States defendant. (2) When the plaintiff is suing the United States, its officers or agencies, place an "X" in this box.

Federal question. (3) This refers to suits under 28 U.S.C. 1331, where jurisdiction arises under the Constitution of the United States, an amendment to the Constitution, an act of Congress or a treaty of the United States. In cases where the U.S. is a party, the U.S. plaintiff or defendant code takes precedence, and box 1 or 2 should be marked.

Diversity of citizenship. (4) This refers to suits under 28 U.S.C. 1332, where parties are citizens of different states. When Box 4 is checked, the citizenship of the different parties must be checked. (See Section III below; federal question actions take precedence over diversity cases.)

III. Residence (citizenship) of Principal Parties. This section of the JS 44 is to be completed if diversity of citizenship was indicated above. Mark this section for each principal party.

IV. Nature of Suit. Place an "X" in the appropriate box. If the nature of suit cannot be determined, be sure the cause of action, in Section VI below, is sufficient to enable the deputy clerk or the statistical clerks in the Administrative Office to determine the nature of suit. If the cause fits more than one nature of suit, select the most definitive.

V. Origin. Place an "X" in one of the seven boxes.

Original Proceedings. (1) Cases which originate in the United States district courts.

Removed from State Court. (2) Proceedings initiated in state courts may be removed to the district courts under Title 28 U.S.C., Section 1441. When the petition for removal is granted, check this box.

Remanded from Appellate Court. (3) Check this box for cases remanded to the district court for further action. Use the date of remand as the filing date.

Reinstated or Reopened. (4) Check this box for cases reinstated or reopened in the district court. Use the reopening date as the filing date.

Transferred from Another District. (5) For cases transferred under Title 28 U.S.C. Section 1404(a). Do not use this for within district transfers or multidistrict litigation transfers.

Multidistrict Litigation. (6) Check this box when a multidistrict case is transferred into the district under authority of Title 28 U.S.C. Section 1407. When this box is checked, do not check (5) above.

Appeal to District Judge from Magistrate Judgment. (7) Check this box for an appeal from a magistrate judge's decision.

VI. Cause of Action. Report the civil statute directly related to the cause of action and give a brief description of the cause. **Do not cite jurisdictional statutes unless diversity.** Example: U.S. Civil Statute: 47 USC 553
Brief Description: Unauthorized reception of cable service

VII. Requested in Complaint. Class Action. Place an "X" in this box if you are filing a class action under Rule 23, F.R.Cv.P.

Demand. In this space enter the dollar amount (in thousands of dollars) being demanded or indicate other demand such as a preliminary injunction.

Jury Demand. Check the appropriate box to indicate whether or not a jury is being demanded.

VIII. Related Cases. This section of the JS 44 is used to reference related pending cases if any. If there are related pending cases, insert the docket numbers and the corresponding judge names for such cases. Provide a brief explanation of why the cases are related.

Date and Attorney Signature. Date and sign the civil cover sheet.